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ISIS

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By Blank and Stoller, Montreal

Oslerian Protobibliothecary 1938

William Willoughby Francis, M. D. 1878-1959

He that is of a merry heart hath a continual feast—*Proverbs, 15: 15.*

WITH the death of William Willoughby Francis* the era in Medicine so long associated with the name of William Osler came to an end, but the influence of these two men so closely linked by ties of family, friends and pupils, and also by the great traditions of the scholar-physician will endure so long as the spirit of humanism enriches the profession of medicine. The good works of Osler and Francis extended through fivescore years and ten, for Osler had first seen the light of day at Bond Head in Upper Canada in 1849 and Francis, who was born in Montreal on 2 April 1878, died on 10 August 1959 at Ormstown, P. Q. where he had gone for his holidays. It was said affectionately of Francis by E. P. Scarlett, the laconic Canadian medical historian, "in a real sense he is the extension in time of William Osler—the postcards, notes and letters which were so characteristic of Osler have continued to go forward, carrying the spirit and blessings of W. O. to the far corners of the earth."**

His close associate in the Osler Library, Lloyd G. Stevenson, on whose broad shoulders the cloak of Elisha has happily fallen, wrote in the *Canadian Medical Association Journal:*† "[Francis was] "absolutely without ambition. . . . He was willing to devote himself for weeks on end to anyone who needed his help. . . . His name appears in a thousand prefaces and notes of acknowledgment. It is written large in the hearts of his many friends. They will not soon forget his patience, his gaiety, his wit, his kindness." It is scarcely surprising that anyone who inspired such warmth of feeling and affection among his many friends should have been known as 'Willie' in his youth and 'Bill' to his intimates in his more mature years. His mother was a first cousin of William Osler who looked upon her five sons and three sisters as members of his own family and to all his nephews and nieces, Osler himself was 'Uncle Willie,'

* Dr. Francis served as Consultant Editor to this *Journal* from the first volume issued in 1946 until his death on 10 August 1959.

** Osler Society of McGill. *W. W. Francis. Tributes from his friends on the occasion of the thirty-fifth anniversary of the Osler Society of McGill University.* Montreal [Canada]. Published by the Society, 1956. xvi, 124 pp., 4 pl.

† 15 September 1959, *81*, 516.

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and *his* favorite nephew was Willie Francis. W. O. helped him through school and indeed throughout life stood *in loco parentis.*

Bill had his early education in Trinity College School at Port Hope, Ontario to which he later often referred with a special nostalgic warmth; but it was at Johns Hopkins University that he obtained his B.A. degree in 1898 after having devoted much of his time to the classics under the dean of 19th century American classical scholars, Basil Lanneau Gildersleeve (1831-1924). With some prodding from his uncle, Francis proceeded to the Hopkins Medical School where he obtained his M.D. in the class of 1902. After two years' internship in Montreal at the Royal Victoria Hospital, he returned to Baltimore as a Fellow in pathology under William H. Welch (1850-1934). Following his year with Welch he had a spell abroad, doing first a tour of duty in pediatrics in London at Great Ormond Street, continuing his study of pathology at Berlin, Vienna, and Paris, and returning again to London for further clinical work. By November 1906 he started a pediatric practice at Montreal which he continued until illness overtook him in January 1911 when he was forced for three years to withdraw from clinical work. During part of this time he was under treatment for tuberculosis at Ste. Agathe Sanatorium.

Prior to his illness he had been a demonstrator in pathology in Dr. Maude Abbott's laboratories of pathology at McGill and it was during this period that his literary interests came to the fore. For the three years from 1912 to 1915 he served as assistant editor of the *Canadian Medical Association Journal* as well as Secretary-Treasurer of the Canadian Medical Association. Shortly after Canada entered World War I he volunteered for overseas duty with No. 3 Canadian General Hospital, organized by the McGill Medical School, serving as Registrar of the Unit.

Since he had had a sound training in the classics at Trinity College School and later at the Hopkins, and had a flair for languages, it is not surprising to find him at the end of the War (following a brief return trip in 1919 for demobilization) in Geneva editing the *International Journal of Public Health* for the League of Red Cross Societies in four languages: English, French, Italian, and Spanish. Dr. Francis remained there until his obligations to the Red Cross had been fully met. On 14 March 1921 while still in Geneva he married Hilda Colley, an English girl also working for the Red Cross. There was one child, Marian, later a McGill graduate in medicine who for a time practised with her husband

Dr. Andrew Kelen, now of Ormstown, P.Q. They have four children.

Sir William Osler had died on 29 December 1919, leaving incomplete the catalogue of his library which had been classified according to a new and original scheme whereby the great books of medical history would be arranged chronologically in a first section to be known as 'Bibliotheca Prima', the lesser books of medicine in a 'Bibliotheca Secunda' listed in alphabetical sequence. Other sections included Bibliothecae 'Historica,' 'Bibliographica,' 'Litteraria,' 'Biographica,' etc. The entries in 'Prima' were to be followed by annotations which would be a painless guide to future students of the history of medicine, enabling them to see at a glance the great landmarks in the historical development of the subject. In January 1922, two years after Osler's death, Francis moved with his wife and daughter to 13 Norham Gardens at Oxford and there for the next eight years he worked tirelessly on his greatest contribution to medical scholarship, the *Bibliotheca Osleriana* which was eventually published on 3 May 1929, a few months after Lady Osler's death. Since the readers of this *Journal* have not previously had a behind-the-scenes picture of Dr. Francis' remarkable work on the Osler Catalogue, let me quote from an account published in 1956 on the occasion of the 35th anniversary of the Osler Society of McGill University, a volume of 123 pages entitled *W. W. Francis: Tributes from his Friends,** as follows:

> In compiling the Catalogue Francis took infinite pains to insure absolute accuracy. His best work was done between 11 p.m. and 2 a.m. when the telephone didn't ring and there was no one to bother him. His besetting sin was to read ahead in every book he took down. Having found what he wanted bibliographically, the lure of the printed page led him always onwards. He had no idea of time, and if the text of some old medical work interested him, he would be likely to retire at 3 or 4 in the morning; indeed, the only thing that seemed to make him go to bed was the attack of migraine which usually came after a long sequence of short nights. . . . The *Bibliotheca Osleriana* will ever stand as an enduring tribute not only to the genius of a great collector but more particularly to the learning, perseverance and patience of a great scholar and a great librarian.

Mr. Reginald H. Hill, who began helping with the technical entries in the Catalogue when he was a junior assistant at the Bodleian Library, set down his recollections some twenty years after Osler's death in a paper read to the Osler Club of London (1930)

* See pp. 32 and 34. This account was based on diary entries of 'a somewhat prejudiced observer' who had opportunity almost daily to see what was going on from January 1922 until the summer of 1925—and during the summer months thereafter till returning to Oxford in July 1928 to live for two years.

and reprinted in part in 1956 in the aforementioned volume of *Tributes to W. W. Francis.* After referring to the other collaborators, Archibald Malloch, Leonard L. Mackall, R. R. Troutman, his Bodley colleague, and the Clarendon Press which published it, Hill presented a vivid picture of Francis as one utterly dedicated to the task which Sir William had set for him. He also recalled his love for Oxford and particularly for the Old Bodleian, characterizing him as "a learned, witty, tolerant and lovable soul."

Throughout the period of her widowhood Grace Revere Osler, her husband gone and her only son Revere killed in the war, lived on in Oxford at 13 Norham Gardens determined to carry out Sir William's desires, at the same time maintaining the traditions of hospitality for which the Osler household had always been celebrated. Students came and went and their girls were 'housed' for Proms; she counselled those upset by the darts of Eros (usually telling them to keep their 'emotions on ice'), but also lending a willing and sympathetic ear to students in trouble, whether financial, academic or romantic. Behind and through it all lay her burning desire to see the library catalogue finished, and so at times she became impatient with W. W. F.'s slow-moving ways. Any encroachments on his time, even by his wife or their precocious daughter, were resented; she wrote letters to Harvey Cushing, Leonard Mackall and, after he had left Oxford, to Archibald Malloch, urging them to press 'Bill' to make haste. Hill, Tortman, and John Johnson, the Printer, were all likewise importuned to urge him on, but Francis worked along imperturbably at his own pace—illustrating Oslerian *aequanimitas* in heroic measure. An unerring disciple of Magdalen's Martin Joseph Routh (1755-1854), he went on verifying his references and in the end his scholarly instincts triumphed. By August 1928 the last pages of the index, the title-page, and Preface of the Catalogue had all been passed for press.

In the late summer of 1928 movers ominously arrived and filled the house with empty boxes, and packing was to start the 1st of September. One morning in the midst of the hurly-burly Lady Osler sent for a young physician who happened to be a house guest. He arrived at her bedside in time to hear her say cheerfully, as her face twitched involuntarily on one side, "You old lunatic, you think I'm having a stroke, don't you?" She died quite peacefully a few minutes later and without having to endure the thing she dreaded most—the sight of empty shelves. A noble and gallant woman, she had 'fought the good fight'—to use a line of her favorite hymn—and at the end had ridden triumphantly from Lexington to

Concord and beyond, as had her patriotic great-grandfather, Paul Revere. And from 1892 when she wed William Osler, William Francis who was treated as a son, rode loyally beside her, even though at times she chid him almost beyond human endurance for the slowness of his ways. Instead of putting pressure on him Harvey Cushing interceded on Bill's behalf, knowing that scholarly work took time, but knowing also in his heart that Grace Osler could not long survive if obliged to live in a house from which Sir William and his books were both gone.*

And so after the Library was safely packed and ready for the high seas and Montreal, Francis with typical Oslerian casualness left their own moving operations to his wife and he arrived in Montreal early in 1929 in time to receive the books. They had been packed almost as methodically as they had been catalogued, so the problem of arranging them in the shelves proved less of a chore than had been anticipated. The Library was officially opened on 29 May 1929. The formal observances included a principal address by William Sidney Thayer,** Osler's devoted friend and a successor in the chair of medicine at Johns Hopkins which (as H. C. wrote afterwards to Arnold Klebs) "included a perfect tribute to Bill Francis."†

After Dr. Bill had settled in Montreal, he enjoyed thirty happy years presiding over the library. He carried on a literary and bibliographical correspondence that became almost Napoleonic in proportions but even after his able and devoted secretary, Miss Cécile Desbarats, joined the staff, he wrote many letters and cards himself either by hand or on the typewriter with the telltale SE/LF at the bottom. Everything that came from his pen, or for that matter from the Osler Library, was cherished and preserved by his wide circle of devoted friends. He had a delightful whimsical style, at once erudite and witty, and whatever he put on paper, even during the austerity of the war years, showed him at heart a gay and happy man with a nature sloping toward the sunny side. He walked through life with a song in his heart and unconsciously imparted happiness wherever he moved.

William Francis' appeal was for young and old, for the child as well as the seasoned scholar, for men and even more perhaps for

* Fulton, John F. Grace Revere Osler, her influence on men of medicine. *Bull. Hist. Med.*, 1949, *33*, 241-251.

** Thayer, William S. "An address on the occasion of the dedication of the Osler Library." *Canadian med. Ass. J.*, 1929, *21*, 1-4.

† Fulton, John F. *Harvey Cushing. A biography*. Springfield, Ill., Charles C Thomas, 1946. xii, 754 pp. (p. 575).

women, especially those who were as quick in lively repartee—if that were possible—as he. He meant much to many, and the subtle spell cast on the lives of those who were close to him, which cannot be described or defined, will, like that of Sir William, long remain a part of them. As Thayer said in his moving Dedication address:

> Earth, also, has its immortalities; the immortality of inheritance; the immortality of repute; and that other, surer immortality which lies in the transmission through generations of the beneficent influence of a noble life. The memory of the man may perish; his influence can never die. The message that was his is carried on through the years, hidden though it may be from the consciousness of mankind; mute but quickening. . . . So speak these books.

With equal justice this might also have been said of William Willoughby Francis whose ashes lie near Sir William's in the midst of the books which they both loved so well.

William Harvey's Debate with Caspar Hofmann on the Circulation of the Blood

New Documentary Evidence

Reported by ERCOLE V. FERRARIO*
Discussed and Transcribed by F. N. L. POYNTER**
Translated into English by K. J. FRANKLIN¶

WHILE engaged on research into certain aspects of the life and work of Albrecht von Haller in the archives of the Bibliotheca Brera in Milan, I chanced to notice a four-page letter in Latin apparently written by William Harvey. On enquiring about this I was told that it had been seen by some Italian medical historians but that it was merely a copy of a published text and so considered to be of little interest. I was still curious about it and obtained a photocopy which I showed to Professor Premuda at the University of Padua. On his advice I sent a copy to Dr. Poynter at The Wellcome Library in London and asked his opinion of its authenticity and if it had really been published. His reply was immediate and most encouraging, even before he had time to make any close study of the text, and at his request I obtained the following information about its provenance from Dr. Valsecchi, the learned Librarian of the Antiquarian Department of the Bibliotheca Brera.

In 1778 the Imperial Government of Austria and Hungary, which was then the ruling power in Lombardy, bought the complete library of Albrecht von Haller, who had died in 1777, from his heirs. It was divided into two equal portions, one part being deposited in the Bibliotheca Brera at Milan and the other in the library of the University of Pavia. As well as the 13,000 printed volumes there were a large number of Haller's own manuscripts. More than 150 years later, after negotiations initiated by the Swiss government, the Italian government under Mussolini exchanged the Haller MSS for a collection of MSS executed by Calepio, the 18th century illuminator of Bergamo. For some reason a few of the manuscripts in Haller's collection were not included in this exchange and were left at the Bibliotheca Brera. It was among these that the Harvey document was found.

* Milan, Italy. ** London, England. ¶ Oxford, England.

There is no way of knowing how this document came into Haller's possession, but it seems likely that he purchased it during one of his visits to Germany.

E. V. F.

HISTORY OF THE TEXT

A glance at the first few lines of this document was sufficient to establish that this was Harvey's famous letter to Caspar Hofmann, written on the occasion of Harvey's demonstration in Nuremberg which failed to convince his opponent of the facts of the circulation of the blood. What was also clear was that this four-page document was very much longer than any published text known to me. Comparison with the latest version available[1] showed that no less than 101 lines of Harvey's original letter had been omitted from the printed version and replaced by the words 'et caeteris'.

What then was the history of the text? And who had been responsible for abridging the original? The current version was traced back without alteration to the official edition of Harvey's *Opera Omnia,* edited by Mark Akenside for the Royal College of Physicians in 1766, where it is printed on pages 635-636 of volume II. It is stated there, as in all the later editions, that the editor was indebted for his text to a *Spicilegium illustrium epistolarum ad Casparum Hofmannum, Norimbergae edita.* No more precise bibliographical details are given in any of the editions. There is no mention of such a work in the standard bibliography of William Harvey, nor is there any trace of it in more general bibliographies or library catalogues, not even in that of the Royal College of Physicians, where one would expect to find the volume from which Akenside copied his text. The blank period which followed this vain search was enlivened by the thought that even when the original printed version were found it would be most unlikely to have any more than was given in the *Opera Omnia,* for whoever was responsible for the excision of 101 lines of Harvey's argument on the circulation it could not have been the College's official editor. The search was then resumed for any volume which contained letters written by or to Caspar Hofmann and an edition of which was published in Nuremberg. The solution of the puzzle was found in the following:

1 Harvey, W. *The circulation of the blood. Two anatomical essays together with nine letters written by him. The whole translated from the Latin and slightly annoted by Kenneth J. Franklin.* Oxford, Blackwell Scientific Publications, 1958, 101 pp.

G. Richteri J.C., ejusque familiarum, Epistolae selectiores. . . . Accedunt I. Richteri vita. II. Orationes duae, de arcanis aulae Justinianae; de poëtarum raritate, ejusque caussa. III. Mantissae sex, quarum prima epistolas continet C. Hofmanni ad varios; secunda, variorum ad Hofmannum; tertia, A. Dinneri ad varios; quarta, variorum ad Dinnerun; quinta, variorum ad varios; sexta denique Judicia septem. IV. Spicilegium epistolarum illustrium. [Edited by J. G. Richter.] pp. 832, 4to. Nuremburg: Michael Endter. 1662.

Part IV of this volume has the heading 'Spicilegium post messem illustrium epistolarum quas viri celeberrimi . . . ad Casp. Hofmannum aliique ad alios scripserunt.' On pages 808-809 is printed the abridged version of Harvey's letter exactly as it is given by Akenside. Immediately following, on pages 809-810, is a version of the long sought for letter from Hofmann to Harvey, dated 19 May 1636.[2]

We have no assurance that the printed version of Hofmann's letter is any more complete than Harvey's. In fact it does have a suspect "&c" which cuts short Hofmann's own statement of Harvey's doctrine, but it does enable us to reconstruct more accurately and in greater detail than has ever before been possible the discussion which was carried on between the two men during Harvey's visit to Nuremberg in May 1636.

Harvey's biographers give the impression that Harvey came to Nuremberg on 20 May 1636 and immediately sat down to write his letter to Hofmann. Only Willis[3] casts doubt on the date of the letter, "the date of the reception I should imagine, rather than the writing, for the letter could hardly have been written to Hofmann from the city where he was resident." Chauvois states "the party arrived on 20 May at Nuremberg"[4] although Sir D'Arcy Power, the source of his information, had written, "Nuremberg was reached on Wednesday, May 11, and the party remained there until Sunday, May 22 . . ."[5] There is, in fact, internal evidence even in the published extract of the letter that Harvey had already met and talked with Hofmann before the letter was written, for he says, "I rejoice at having seen and spoken with a man so learned . . ." In Hof-

2 *See:* Harvey, W., *op. cit.*, p. 5, where Hofmann is located in the wrong Altdorf. After the search was successfully concluded and this note was already drafted, my friend Dr. Walter Pagel drew my attention to a book which would have given us a valuable clue had either of us remembered it sooner. This is J. J. Baier's *Biographiae professorum medicinae qui in Academia Altorfina unquam vixerunt*, Nuremberg, 1728, which has an excellent biographical account of Hofmann with a footnote on page 43, "Vid. eius epistola cum respons. Harvei, in Richterianis, p. 808.9."

3 Willis, R. *William Harvey*. London, C. Kegan Paul, 1878, p. 216.

4 Chauvois, L. *William Harvey*. London, Hutchinson, 1957, p. 128.

5 Power, *Sir* D'Arcy. A chapter in the life of Dr. William Harvey, 1636. *Proc. roy. Soc. Med.*, 1917, *10* (Sect. Hist. Med.), 38.

mann's letter of 19 May, to which Harvey was replying, Hofmann himself says, ". . . as I promised you yesterday . . . ," so that the two men must have met on 18 May, and that was not necessarily the first of these meetings during Harvey's visit. By an error in his dates, Power discounted the possibility of the demonstration being given by Harvey during this visit, for, he argued, "As the Embassy left Nuremberg on Sunday and the letter was written on Saturday, it does not seem likely that the promised demonstration was given at this time."[6] The letter was written, not on Saturday but on Friday, 20 May, and the demonstration could have been given on the following day. That it had already been given when the letter was written now seems clear from Harvey's own statement, and his letter must be taken as a parting shot in the discussion and not as the opening gambit. This seems to be the order of the events: Harvey and Hofmann met and discussed the circulation on 18 May; Hofmann promised that he would give Harvey his decision when he had seen Harvey's demonstration. This took place at Altdorf on 19 May and was performed with Harvey's accustomed skill. Hofmann remained unconvinced and after Harvey's departure he sat down and wrote the letter to Harvey in which he placed his objections on record. Harvey's reply expresses his bewilderment that a man with Hofmann's knowledge and experience could fail to see so clearly what he had already demonstrated successfully to many other anatomists. He suggests that Hofmann should try the experiment for himself and if the techniques are properly carried out he would obtain the same results as Harvey had obtained at Altdorf the day before.

It would be interesting to know if Hofmann followed up this impressive statement of Harvey's belief in the objectivity of scientific method and whether it was this which led to the less stubborn attitude which his pupil Slegel noticed in his last years. Hofmann's long opposition to Harvey's doctrine has puzzled all those who have studied his own writings on the heart and blood. Baier[7] says that Hofmann enjoyed such a great reputation and his opinions were given such weight that he came to adopt a dictatorial attitude toward scientific problems and once he had formed an opinion he stubbornly refused to change it. Pagel wrote in 1957: "Hofmann's resistance is surprising in view of his spirited and sustained rejection of the Galenic pores of the septum, his assumption that arterial blood is driven into veins through anastomoses, and his statement

[6] *Op. cit.*, p. 39.
[7] Baier, J. J. *Op. cit.*, (n. 2), p. 18.

that in the embryo the heart forms two vessels—the artery and the vein—through which "the blood goes and returns."[8] One of the most interesting new facts revealed in the document printed below is Harvey's statement that there were actually English anatomists who did not hesitate to declare in public that Harvey had taken his ideas of the circulation from Hofmann and that he, Harvey, had been forced to produce their letters and show the dates in order to refute these charges. An even more extraordinary fact, commented on by Baier[9] in 1728, by Richard Landau[10] in 1902, and by Bayon[11] in 1939, is an event which occurred at Altdorf in April 1622 when the idea of the circulation of the blood was proposed to Hofmann by his own pupil Helvicus Dieterich (1601-1655). The occasion was a public disputation at which Dieterich was defending a thesis on the function of the brain. His own account of how his proposition was received indicates Hofmann's attitude so clearly that it is worth quoting in full:

> Moreover, I there dissected several animals, both living and dead, and in more than one vivisection of a dog I carried out, as physicians still living will testify, almost the identical experiment by which, not long afterwards, the learned Harvey taught the whole medical world the movement and circulation of the blood. Then, like Terence's young Phaedria, I was overwhelmed with delight and immediately announced the new discovery which had been revealed to me to my teacher, Master Hofmann, really persuading myself that surely the motion of the blood could hardly be otherwise than circular. From him, however, I had for answer only his customary 'Pah!' together with this wisecrack, "You don't want to become a circulator, do you!"[12]

It is not improbable that rumours of Harvey's lectures at the College of Physicians in London had already been discussed on the Continent. The fact that letters (now lost) which had passed

8 Pagel, W. The philosophy of circles. *J. Hist. Med.*, 1957, *12*, 151.

9 Baier, J. J. *Op. cit.*, p. 48-9.

10 Landau, R. Ein deutscher Vorlaufer Harvey's. *Janus*, 1902, *7*, 60-63. This is a brief report taken from Baier.

11 Bayon, H. P. William Harvey, physician and biologist. Part V. *Ann. Sci.*, 1939, *4*, 354.

12 Dieterich, H. *Vindiciae adversus Otthonem Tachenium*. Hamburg, Typis Pyerianis, 1655, p. 194. This title should be added to the list of Harvey allusion books by E. Weil, in *J. Hist. Med.*, 1957, *12*, 167-174. The English translation is my own. Phaedria is the naïve young man in Terence's play, *The Eunuch*. The Latin word 'circulator' also signified an itinerant quack. The original Latin is as follows:

> Caeterum plurima ibi secui animantia cum viva tum suffocata; et in cane vivo non uno dissecto idem imo praecipuum fere inveni experimentum, ex quo non multo post doctissimus Harveus totam Medicorum Scholam motum at circulationem sanguinis docuit, ut Medici etiam nunc superstites testabuntur. Ego tum Iuvenis Phaedriae Terentiani instar omnibus laetitiis incessi, statimque novum mihi visum inventum ad praeceptorem meum Dm. Hofmannum detuli, certo mihi persuadens, vix alium sanguinis motum nisi circularem esse posse, a quo tamen ejus consuetum "Pae" responsi loco tuli cum hos dicterio, "Visne fieri circulator?"

between Harvey and Hofmann were cited to refute those who denied Harvey's priority leads us to believe that Hofmann had heard something of the circulation direct from Harvey and that he had thus early come to an adverse opinion of it, an opinion vividly reflected in this passage from his pupil's book.

The Authenticity of the Document

The letter must have been in the possession of Georg Richter in Nuremberg in 1662 and from him may have passed into the collection of Johann Jakob Baier who informs us in his biographical history of the Medical School at Altdorf (1782) that he had more than a hundred of Hofmann's letters. Baier died in 1735 and Haller took up his post at Göttingen in 1737 so that he could have obtained it from Baier's heirs.

At first glance this document seems to be much too well written to be in the hand of William Harvey, which was notoriously bad. Is it, in fact, Harvey's? The surviving examples of his handwriting known hitherto are his own personal lecture notes, not written for others' eyes, notes and inscriptions in books, letters in English, and one single Latin letter written later in life to his friend and colleague at the College of Physicians, Baldwin Hamey. None of these is as clear and legible as the letter to Hofmann but there is a resemblance in the formation of the individual letters and in the style of the abbreviations. The signature is unlike other known signatures where the 'H' of Harvey comes well below the line.

Is it then a copy, as had been thought? The hand is neither German nor Italian but definitely an English hand of the period. The name of the month in the date is actually given in English as 'May.' Did Harvey, realising that his own handwriting was 'difficult,' get an English companion to serve as his amanuensis? That remains a possibility until the letter is read in its entirety and there we find Harvey himself declaring that 'my fingers ache with weariness from holding the pen and I have other matters to attend to.' No amanuensis could have written this above the signature of William Harvey, so that here we have a unique and important specimen of Harvey's 'formal' hand, such as he probably used for the final drafts of his own works. The fact that he attached great importance to his letter to Hofmann would have led him to write it in his best 'copy-book hand.' Handwriting was still an important index of culture in 17th century Europe, and a letter written in the hand of the lecture notes, apart from being almost incomprehensible to its

recipient, would have done nothing but harm to the reputation of its writer. He tells us that it was a laborious task, and evidence of this can be seen in the letter where an occasional tendency to 'sprawl' is immediately restrained. So anxious was Harvey that no word or phrase should be misunderstood that he was considerate enough to follow the then German practice of marking the accents on the Latin vowels. He was also careful over his Latin grammar; some of the case endings have been corrected and overwritten and in one phrase on folio 3 a space has been left for a verb which he forgot to include before sending off the letter.

Now that we have this example of Harvey's 'fair' hand, the often repeated suggestion that the number of errors in the first edition of his *De motu cordis* sprang from his bad handwriting rather than the printer's carelessness must be reconsidered.

F.N.L.P.

Caspar Hofmann's Letter to William Harvey, 19 May 1636

Casp. Hofmannus, Guil. Harvejo.

Humanitas tua incredibilis, *mi Harveje,* facit, ut jam non diligam te, sed deamen. Quo facilius a me impetrare potui, ut quod heri promisi, judicium meum de circulatione sanguinis tua, hodie praestem. Spes autem est, accepturum te eo animo, quo ego do, non ullo tincto livore, quo te pungam; nec ulla elato arrogantia, quo ultra te sapere videar: Sed simplici & candido. Quamobrem etiam spondeo tibi, si discussis nebulis, VERITATEM Hespero & Lucifero pulcriorem, ostenderis mihi, me cum Stesichoro, palinodiam publice canturum, & in partes has concessurum. Et ne ambages quaerere videar, sensum tuum puto esse talem, *sanguinem ex corde in arterias translatum &c.*

"Heic ego tecum primum rhetorice agam: I. Videris Naturam accusare stultitiae, quae tantopere erravit, in opere paene primatio, confectione & distributione alimenti! Quo semel admisso, quid non sequetur confusionis in aliis operibus, quae a sanguine dependent.

"II. Videris re ipsa damnare, quod verbo laudas, receptum ab omnibus eligium Naturae; neque deficere illam in necessariis, neque vero abundare in superfluis, & c."

Haec ego volui, ut liberem fidem meam, quae accipies ea manu, qua ego dedi. Tu mi Harvee, bene age, & bene ambula cum Illustrissimo Comite Tuo, Domino meo Gratissimo, *à chi baccio le mani humilmente.* Perscriptum Altdorfii 19 Maji MDC XXXVI.

(From: Richter, G., *Epistolae selectiores.* Nuremberg, 1662. pp. 809-10)

WILLIAM HARVEY'S LETTER TO CASPAR HOFMANN

JVDICIVM tuum (mi Hoffmanne doctissime) de me, de motu et circulatione sanguinis, candida mente scriptum, pergratum mihi est; atque me vidisse hominem doctissimum et allocutum fuisse gaudeo, cujus amorem ita libentissime amplector, ut redamem. Primum oratoria facultate me criminari, et tacite castigare placuit, quod visus sim tibi, Naturam stultitiae erroris insimulare et damnare; atque artificis stolidissimi, ignavissimique, personam ipsi imponere, eo quod sineret sanguinem recrudescere; et[1] ut concoquatur, rursus iterum iterumque in cor remeare, et toties in habitum ut recrudescat; atque eo fine Naturam, ut habeat quod agat, factum et perfectum sanguinem, frusta pessundare. Verum enim vero, ubi aut quando, haec talia a me, aut dicta aut cogitata fuere, cum latet (qui semper Naturae solertiam, sapientiam, industriam, sim admiratus) non parum me perturbat,[2] talem viro aequissimo videri. In libello edito ego motum sanguinis e corde per arterias in habitum, et similiter ex eodem per venas retrorsum ad cor, continuo et continenter fieri duntaxat assero, eo fluxu et refluxu, ea quantitate et copia, ut in circuitu, quodam modo moveri, sit necesse. Sed de coctione et causis hujus motus [et] circulationis, praesertim de causa finali (si placuerit caput viii et ix. relegere) neque loquutum fuisse, et omnino consulto praetermisisse, apertis verbis reperies.[3] Quin parum Anatomicum me esse Analyticum parum pergis incusare, ob id, quod διότι non constituto τῶ ὅτι investigare nitor: amabo candide et amantissime, legas summam omnium mearum assertionum cap. 14. Historiam solam τοῦ ὅτι tantum astruere nullam speculationem Physiologicam adjungere, aut causas superaddere, neque propter quid Natura per pulsum Cordis hunc motum praestet sanguini invenire poteris. Non nego Cap. 8 me obiter inserere illustrationis gratia, ut verisimiliter contingere potest, quod partes a corde per influentem calorem sanguinis foveantur, & vice versa sanguinem in partibus labefactari vel aliquid pati, ita ut rursus perfectionis recuperandi causa Cor et caloris fontem repetat. Sed an ita sit nec ne, nondum demonstrasse profiteor nondum plura dixisse. Similiter capitulis ultimis ex consequentiis et observataionibus anatomicis circumlationem fieri probabiliter colligo, nusquam causas (praeter movens cor vi sua pulsifica appono. [fo. ii.] ΔειΚτιΚῶς et oculorum testimonium desideras, plane ubique vero scriptum est, & jam edico tibi me tam clare meis oculis vidisse, & plurimorum doctissimorum Virorum perspicacissimis saepissime cernendum per virorum Anatomen multoties iteratam exhibuisse motum sanguinis e venis in cordis ventriculos, et ex inde per arterias pulsu cordis in habitum, ex cunctis partibus denique per venas sanguinem cor repetere, idque tanta copia fluxu adeo impetuoso, ut de circulatione dubitandi locum

1 'Rursus' inserted here in the printed text of 1662, etc.
2 'Perturbavit' in printed text.
3 End of printed text.

nil moraris, affirmando contrariorum malúm aut confusionem. Ut
at verear, ne si singulis responderem, mi volúmen excresceret pagina: et pa-
tientiã nimis abúterer, dũ audi, aut libellúm tu legendo non animad-
vertisti, aũt oblitus es, vellẽ me non capisti, aut ni male memini, hæc alio-
cliones mihi hîc agitata responsa habent, et non redarguũnt, nunq non
reincrendæ quæ vel per aulopsiam vel probabili argumentatione circui-
tũm Domini scil licet vias vel facultates non noscat, posteriora enim talis
inquisitio, et cytalibi contradicentia nimis Elenchica. Sed quando quidẽ
devinctum dubijs cytiricarem, et non quòd mihi ipsum ôlle ad miras, so-
lutiones pelli, promitto, sed recte secundũm Analyticam disciplinam
quando historiam recte noveris et concessero. Nunc methũ nemo pa-
tiũm Analyticum veræ præcipes, causas assignantem aut dubia solven-
tem, qui (quod sit) non necesse sit: est enim sophistica via et quasi
de[illegible]ente speculari. Jam pro lassitudine dolent currente calamo dicti,
[illegible]a avocant negotia. Hæc ego volui purgandi causã apud virum
doctissimum amandissimum dũl metuens censura infamia liberarem.
Et quæso te, doctissime, aquissime: si quæ de circulo affirmãsse oculis
meis videre volueris, illud spondeo quòd Anatomicum magis deest quàm
de cujus voluéris et debitũr accessio me præstolãtem, [illegible] et actual
[illegible] nolim quàm observo aliorum mẽ stream vilipendere aut vitia notare,
aut Somini probe non prorsus insepto nec deliranti mi videor per bo
annos experta fidem derogare. Jam vale et fave, et pariter me
cum agas, eo animo quo scripsisse te animo dixti candido et benigno
accipio, tu quoq hæc simile rescribenti mihi stati ẽ pectore. No
Zimbere May 20. 1636.

Tuus

Guliel Harveius Med. Reg.
et Professor Analomi: Colleg
Medic. Londinens Anglus.

esse non videretur reliquum. At ne aegre feras quaeso Anatomicum (quippe qui animal rationale) rationibus a sensu petitis & ex omnium Anatomicorum concessis insuper desumptis uti atque illis qui nunquam oculis Anatomiam lustrarunt, aut conspectum talium refugiunt exercitationis causa historiam ab autopsia desumptam probabiliter confirmare. Scire te disp[l]iceat Primiroseum mecum eadem navi calculos supputare, quandoquidem omnes Anatomici systolen & diastolen in corde, dilatationem & constrictionem fieri agnoscunt, et in dilatione sanguinem e vena cava acceptum dilatatum cor replere, et in constrictione eiusdem in arterias transfusionem sanguinis fieri (ex textura cordis, et valvularum artificio, aliisque multis cordis edocti) non possunt negare, atque necesse est. Si aliqua transmissio & aliqua quantitate in singulis pulsationibus fiat; supponant quamvis licet, (non ego quantum vidi refero) ex supposito statim evicti supputatis pulsationibus circum ire ut concedant necesse habeant. Sin vero te lubido visendi, et experiendi percipit, quantum singulae constrictiones cordis perpendant, & propriis oculis ea lustrare quae fidem facere certiorem possint, tam certe clare, evidenter (administrationibus rite peractis) quid mihi accidit, apparebit, quam te Altorfium heri vidisse scias, et tam exploratum habeo sanguinem per arterias in habitum diffundi, quam quod Tamesis noster in mare, et in minoribus venis in majores & ad cordis basin usque ex habitu undiquaque, tam patente transitu & confluxu, quam Pegnitz vester in Regnitz aut ipsa in Moenum, quam Moenum Mosellaque in Rheni alveum procumbunt.

Hucusque magis contra me Judicium viri optimi sententiam dixit, quam circulationi contrariam, Nam esto, parum sum Anatomicus, pessimum Analyticum, videturque viro probo et docto, me injuriam dicendo Naturae fecisse. Ergo circuitum sanguinis non esse! non sequitur. Falleris, mi amantissime, si me adeo ambitiose pro istac vel pro ulla opininione [*sic*] contentiosum judicaveris, ut contra-dictoria verba (praesertim ab Hofmanno meo) ferre absque [fo. iii] omni ira non possim, cujus conspectum ita expetiverim, ut aditum negligere nullo modo potuerim, cuius familiaritate & colloquio adeo delectabar & a quo literas hasce propria manu scriptas habere me tam multum gaudeo. Quando quidem non defuerunt in Anglia tales, qui me inventorem circuitus denegare publice exercitiis suis Anatomicis nixi, et (tuis citatis scriptis) me a te instructum et edoctum ita existimasse docuerunt ita ut collatis utriusque nostrum scriptis et temporibus mihi purgandi causa apologiam facere necesse erat. Postremo in gratiam & favorem accipio libenter quod me decere . . ., videlicet sanguinem in vasis non ut aqua in ductibus suis aut Tamesis noster in alveo suas volvat lymphas recta via ad Oceanum; sed (quod rectius Ille Scaliger Fluctuationem in Aristotele interpretatur, quae me captivum hariolaris tenet) ut in stagno aliqua Aqua aut in mari semper Fluctuat, et uti absorbendo imbibat ripa humidum non mediocri quantitate. Ita partes

nutriendae semper hauriunt. Verum amabo, doctissime amantissime, jam in te cudatur faba. Aqua stagnans fluctuatne? ignos[c]as non intelligo: vel ut in mari fluctuat? Suspecta alternativa, sed si ut in mari! est fluxus et refluxus statutis temporibus & proinde debet permeare et remeare sanguis in vasis et Natura potius distinctum & determinatum vellet, quam indeterminatum et confusum in ipsis vasis: insuper quare terrae AEgypti non a praeterlabente Nilo aeque hauriunt humidum, ac si stagnaret! Non capio. Neque- partibus effluente sanguine elicitum nutrimentum posse adhaerere et in Cambium transmutari? me fugit. Reliqua in tuis literis contra circuitum prolata in te sunt dubia qui in porositatibus et caecis carnis meandris haeres. Modum transitus, et vias facultates quas postulas, (absque tergiversatione) obstacula contrariorum motuum expultricis et retentricis opponis et causam finalem petis, et solutionem dubiorum perfecte constitutae veritatis signum scis (dicis) Cor a jecore trahere, cur non obstat jecoris attractrix retentrix! et quibus viis et spiraculis, per Anastomasin, an meditate per parenchyma jecoris e venis meseraicis in Cavam sanguis perveniat: nunquam vidisti tamen nil dubitas quod sit. Alimentum ab intestinis per exiguas et capillares ramificationes portae venae attolli in hepar, et simul & eodem tempore sine omni impedimento sanguinem in intestina distribui [fo. iv] nil moraris, affirmando contrarietatem motuum aut confusionem. At vereor, ne si singulis responderem, in volumen excresceret pagina, et patientia nimis abuterer, atque audi, aut libellum tu legendo non animadvertisti, aut oblitus es; vel tu me non capis; aut ni male memini tuae objectiones in libro agitatae responsa habent, et non redarguunt; namque non reiiciendus, qui vel per autopsiam vel probabili argumentatione circuitum admiserit, licet vias vel facultates non noscat, posterior enim talis inquisitio, et ex talibus contradicentia nimis Elenchica. Sed quando quo te devinctum dubiis extricarem, et non quominus ipsum ὅτι admittas, solutiones petis, promitto, sed rectius secundum Analyticam disciplinam quando historiam recte noveris et concesseris. Nunc metuo ne me parum Analyticum vere judices, causas assignantem aut dubia solventem illi, qui (quod sit) non concesserit: est enim sophistica via et quasi de non ente speculari: jam prae lassitudine dolent currente calamo digiti, & alia avocant negotia. [4]Haec ego volui purgandi causa apud virum doctissimum, amantissimum, et ut me tantae censurae infamia liberarem. Et, quaeso te, doctissime, aequissime; si quae de circuitu affirmaram, oculis cernere volueris, illud spondeo, quod anatomicum magis decet, quandocunque volueris et dabitur occasio, me praestiturum; sin illud aut nolueris, et neque per te ipsum investigare dissectionibus placuerit; noli, inquam, obsecro, aliorum industriam vilipendere, aut vitio vertere; aut homini probo, non prorsus inepto, nec deliranti, in re toties per tot annos experta, fidem derogare.

[4] Printed text is resumed here.

Jam vale et cave, et pariter mecum agas, eo enim, quo scripsisse te animo dixti, candido et benigno accipio. Tu quoque fac simile rescribenti mihi tali e pectore.

Norimberg. May 20, 1636.
Tuus
Guliel Harveius Med. Reg. et
Professor Anatomi: Colleg Medic.
Londinens. Anglus.

(From the original autograph in the Bibliotheca Brera, Milan.)

Caspar Hofmann to William Harvey

Translation by K. J. Franklin

Your unbelievable kindness, my Harvey, makes me not only like you but love you. Hence you have more readily obtained from me my fulfilment today of what I promised you yesterday, namely, my opinion of your circulation of the blood. I hope, moreover, that you will accept it in the spirit in which I give it to you, with no malice to vex you, and without any conceitedness to make it appear that I know more than you. But simply and frankly. For this reason I guarantee you that if, after the clouds have been dispelled, you will show me the truth which is more beautiful than the evening and the morning stars, I will with Stesichorus publicly recant and retire from the field. And in order that I may not appear to seek circumlocutions, I think your sense is, *the blood carried to the arteries from the heart, etc.*

"I will first deal with you here rhetorically. I. You appear to accuse Nature of folly in that she went astray in a work of almost prime importance, namely, the making and distribution of food. Once that is admitted, what degree of confusion will not follow in other works which depend on the blood?

"II. You appear to disapprove in fact of that which you praise in word, namely the universally accepted view of Nature, that she is not lacking in the essentials but does not, however, abound in unnecessary things, etc."

To discharge my pledge, I wish you to receive these messages from my own hand. Fare you well, my Harvey, and walk well with your most illustrious Count, my most gracious Lord, whose hands I humbly kiss.

Written at Altdorf, the 19 May 1636.

William Harvey to Caspar Hofmann

Your frank opinion of me, my learned Hofmann, and of the movement and circulation of the blood, was very pleasant to me, and I rejoice at having seen and spoken with a man so learned, whose affection I so gladly accept as to return it. First you thought fit to indict me rhetorically, and tacitly to censure me because I seemed to you to charge and convict Nature

of folly and of error, and to characterize her as a very stupid and idle worker to the extent that she would let the blood recrudesce, and with a view to its concoction let it return again and again to the heart, and with a view to its recrudescence equally often to the body in general, and this with the object that Nature, in order to have something to do, may uselessly destroy the formed and perfected blood. But indeed, as I am quite unaware where or when I said and thought such things, and as I have always been full of admiration for Nature's skill, wisdom, and industry, I was not a little upset to have been given such a reputation by a man so very fair-minded as yourself. In my published booklet I simply assert that there is a continuous and uninterrupted movement of blood from the heart through the arteries to the body as a whole, and likewise back from that body as a whole through the veins to the heart, with such flow and ebb and in such quantity and amount that it must somehow move in a circle. But with respect to the coction and the causes of this movement of circulation, especially with respect to its final cause, you will find it clearly stated (if you will kindly re-read chapters 8 and 9) that I have made no mention, indeed, that I have deliberately quite forgone any discussion of these matters.

Nay more, you proceed to find fault with me as being too little of an analytical anatomist in that I try to investigate the final cause without establishing the facts, I shall be grateful, my frank and very well-wishing friend, if you will read the summary of the whole of my assertions in chapter 14. You will be able to discover that I give merely the facts and add no physiological speculation or extra causes, nor the reason why Nature produces this movement of the blood through the pulsation of the heart. I do not deny that in chapter 8 I insert incidentally for the sake of illustrating what might well happen that the parts are nourished from the heart through the inflow of heat in the blood, and that contrariwise the blood is impaired or undergoes something in the parts so that to recover again its perfect state it seeks once more the heart and source of its warmth. But I do not claim to have shown whether or not this is so or to have said very much about it. Similarly in the last chapters I concluded from the consequences and from my anatomical observations that a circulation probably occurs though I nowhere give causes for such (save for the movement of the heart and for its pulsatile power).

By way of demonstration, since you crave ocular evidence, the circulation of the blood has been clearly described everywhere, and I now declare to you that I have also seen it clearly with my own eyes, and that I have very often demonstrated it by repeated vivisections to very clear-sighted folk among very many most learned men, that the blood moves from the veins to the ventricles of the heart, and thence through the arteries by means of the heart beat to the body as a whole, and finally from the parts of that whole the blood seeks out the heart by means of the veins, and

that in such amount and with so vigorous a flow that there appears to be no place left for doubt about a circulation.

But bear me no ill-will, I pray, that I, as an anatomist (and a thinking animal) make use of reasons derived from sensation and taken from the selected admissions of anatomists as a whole, not for the sake of a rhetorical exercise but to confirm, probably, for those who have never visually examined anatomy or who shun such sights, a statement of fact deriving from an autopsy. Can it displease you that Primrose is making calculations on the same lines as I myself, since anatomists as a whole acknowledge that systole and diastole, or constriction and dilatation, do occur in the heart and in dilatation the blood received from the vena cava fills the dilated heart and in its constriction they cannot deny that blood is transfused into the arteries (as they have been taught by the texture of the organ and the cunning device of the valves and many other things about the heart). If any transmission of blood occurs in any amount in individual pulsations, let them suppose whatever quantity they wish (I am not referring to how much I saw), immediately convinced on this basis by the computed pulsations, they must agree that the blood goes around. If, however, you wish to see and feel for yourself how much the single constrictions of the heart account for, and see with your own eyes facts which can make your belief more certain, what happened to me will be as surely, clearly and evidently apparent (with the techniques properly carried out) as you know you saw yesterday at Altdorf, and I am as certain that the blood is diffused through the arteries into the body as I am certain that our Thames falls into the sea, and within the smaller veins to the larger ones and to the base of the heart from the body as a whole, with such free passage and confluence as your Pegnitz flows into your Regnitz or your Main and Moselle into the catchment of the Rhine.

Up to this point the opinion of a very good man has spoken against me personally rather than against the circulation. For granted that I am not much of an anatomist, and a very bad analyst, and it appears to an upright and learned man that I have slandered Nature, it does not therefore follow that the circulation of the blood is non-existent. You are wrong, my very dear friend, if you judge me so vainly obstinate on behalf of that or any other opinion that I am quite unable to bear contradictory words (especially from my Hofmann, to the sight of whom I had so looked forward that I could not in any way miss the chance of seeing him, whose friendly discourse used so to delight me, and whose letters, written in his own hand, now bring me so great joy). Indeed, there have not been wanting in England such people as have striven in their public anatomy lectures to deny me the discovery of the blood circulation and (quoting your writings) have taught that I was indebted to your training and instruction for my doctrine so that I had to compare our letters and dates in order to defend and clear myself. Finally, I accept gratefully and favour-

ably your [conclusion] that the blood in its vessels is not like water in its aqueducts or our Thames rolling its streams in their channel straight to the ocean, but, (as the great Scaliger more correctly interprets the fluctuation in Aristotle which, you say, holds me captive) as there is always some flow of water in a pond or in the sea, and as the river-bank takes up moisture in no small amount by absorption, so the parts requiring nourishment are ever thirsty. But I shall be happy, my dear and learned friend, if you now take your hammering. Does water flow in ponds? (You will forgive me, but I do not understand.) Or does it flow as in the sea? A suspect alternative, but supposing it does flow as in the sea? There is a flow and ebb at set times and equally the blood must penetrate and return in its vessels and Nature would wish [something] distinct and definite rather than indefinite and confused in her vessels. Moreover, why do the lands of Egypt not get such moisture from the Nile as it flows past, just as if it were inundating? I do not grasp it. Equally how the nourishment drawn off in the effluent blood adheres and is changed into cambium escapes me. The remainder of the doubts advanced in your letters against a circulation are there because you boggle at porosities and blind meanderings of the flesh. The method of passing and possible routes for which you ask are frankly hindrances to the contrary movements of expulsion and retention and you seek the final cause and you say the solution of doubts (is) a sign of a perfectly constituted truth. The heart draws from the liver, why is this latter's attractive and retaining power no obstacle to you? And by what ways and vents, by anastomosis, or directly through the parenchyma of the liver can the blood reach the cava from the mesenteric veins? You have never seen it but you have no doubt that it is so. Does the liver raise nutriment from the narrow and capillary branching of the portal vein and at one and the same time is blood distributed quite unimpeded to the intestines? You cannot stop me by affirming a contrariety of movements or a confusion. But I fear lest, if I were to reply to single points, this page would expand into a volume and I should overmuch abuse your patience. And listen, either you did not pay attention to my booklet in reading it or you forgot so to do. But do you not grasp the book? Or unless my memory is at fault your objections raised here have their answers treated of in the book and do not refute me. For the man is not to be rejected who admits the circulation through autopsy or probable proof, even if he does not know the routes or facilities, for such inquiry comes later, and contradiction from such things is too argumentative. But since you seek solutions so that I could free you from your doubts, and not to prevent your allowing the cause itself, I promise them, but more correctly according to analytical science when you know the facts correctly and acknowledge them.

Now I fear lest you truly judge me too little of an analyst, assigning causes or solving doubtful points for him who will not admit the existence

of the facts; for it is a sophistical way and like speculating about the non-existent; my fingers are already painfully tired from holding the pen and other matters call me away. I have wanted to say these things in order to remove misunderstanding and to free myself from the disrepute of censure on such a scale, and I beg you, most learned and fair-minded friend, if you wish to see with your eyes anything that I affirm about the circulation, just to let me know the facts and I guarantee, as is more becoming in an anatomist, to be present whenever you wish and I am given the opportunity. If, however, you are unwilling for this, or it does not please you to investigate by your own efforts in dissection, at least, I adjure you, refrain from despising the industry of others or turning it into a fault, and do not refuse to trust an honest man, who is not unskilled or mentally deranged, in respect of something which he has tested so often over so many years.

Now farewell and take care to act as I do, for I am accepting your letter in the frank and friendly spirit in which you say that you wrote it. Do you also treat me similarly as I reply to you with equal good-will. Nuremberg, 20 May 1636.

Your
William Harvey, Physician to the King
and Professor of Anatomy at the College
of Physicians of London. Englishman.

St. Thomas Aquinas on the Movement of the Heart

VINCENT R. LARKIN*

Introduction

THE letter *De Motu Cordis,* which is here translated, is regarded as an authentic work of Thomas Aquinas by Mandonnet and Grabmann.[a] The letter is addressed to a Master Philip. Mandonnet says he was professor of medicine in Bologna and afterwards in Naples,[b] but, as Eschmann observes, this has not been established by Mandonnet.[c] We conclude then that nothing definite is known about Master Philip. Mandonnet sets the date of composition at 1273, but Eschmann prefers 1270/1.

The *opusculum*[d] is found in the following editions of Thomas' works:

Opera Omnia, Rome, 1570-71, vol. XVII, p. 214. Piana edition.

Opera Omnia, Parma, 1852-73, vol. XVI, p. 358. Parma edition.

Opera Omnia, Paris, 1889, vol. XVII, p. 508. Vives edition.

Opuscula Omnia, Paris, 1927, vol. I, p. 28. ed. Mandonnet.

Opuscula Omnia, Paris, 1949, vol. I, p. 62. ed. Perrier.

Opuscula Philosophica, Turin, 1954, p. 165. Marietti edition.

The present translation has been made from the Marietti text edited by R. M. Spiazzi, O. P.[e]

Because the argument of this *opusculum* is not easy to follow, I have numbered the paragraphs. It is hoped the following outline will be helpful:

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[a] P. Mandonnet, O. P., *Des écrits authentiques de St. Thomas d'Aquin,* éd. II, Fribourg, 1910, p. 104, n. 18; M. Grabmann, *Die Werke des hl. Thomas von Aquin,* Münster, 1949, pp. 347-348.

[b] *Opuscula omnia,* Paris, 1927, vol. I, pp. xxv, xxvi.

[c] I. T. Eschmann, O. P., "A catalogue of St. Thomas's works" in E. Gilson, *The Christian philosophy of St. Thomas Aquinas,* New York, 1956, p. 419.

[d] For a summary of the contents of this work, see Walter Pagel, "The philosophy of circles—Cesalpino—Harvey, a penultimate assessment," *J. Hist. Med.,* 1957, *12,* 141-143.

* The translations of Thomas in the footnotes were made from *Summa theologiae,* Ottawa, 1941 and from *Summa contra Gentiles* in *Opera omnia,* Rome, 1888-1906. The Aristotelian references are to the Greek text, *Aristotelis opera,* ed. Immanuel Bekker, Berlin, 1831; the Platonic ones to the Greek text, *Platonis opera,* John Burnet, Ed., Oxford, 1899-1906.

PART I

I. THE PROBLEM

The Movement of the Heart
- A. What is its origin? (par. 1)
- B. What is its nature? (par. 1)

II. OPINIONS

As to origin

The principle of heart movement is
- A. not the soul:
  - neither 1) the nutritive soul (par. 2)
  - nor 2) the sensitive soul (par. 3) Refutation (par. 23)
  - nor 3) the intellectual soul (par. 3)
- B. an intelligence (par. 5) Refutation (par. 6, 7)
- C. heat (par. 8) Refutation (par. 9, 10)

As to nature

Heart movement is not natural because it is
- A. in opposite directions (par. 4) Refutation (par. 22)
- B. violent (par. 4) Refutation (par. 4)

III. SOLUTION

As to origin

The principle of heart movement is the soul

As to nature

Heart movement is natural
- because the soul is the form of the body (par. 15, 16, 17)

PART II

I. HEART MOVEMENT CONSIDERED IN ITSELF

Cardiac cycle consists of a push and a pull with a rest period in between (par. 19, 20)

II. HEART MOVEMENT IN RELATION TO EMOTION

Emotions cause modification of cardiac rhythm (par. 25, 27)

TEXT

1. Because everything that is moved must have a mover,[1] we can pose the problem: what is it that moves the heart and what is the nature of its movement?[2]

2. Now its movement does not seem to proceed from the soul.[3] The heart is not moved by the nutritive soul, for the functions of the nutritive

[1] Cf. Aristotle, *Physics*, vol. I, Bk. VII, ch. 1, 241 b 24. Also Aquinas, *Summa theologiae*, vol. I, Pars. I, q. 2, art. 3 c, p. 13 b.

[2] Aquinas, *ibid.*, vol. II, Pars I-II, q. 37, art. 4 c, p. 918 b: "Man's life consists in a certain movement which flows from the heart to the other parts of the body."

[3] Plato defines the soul as the self-moving source of motion in *Laws*, vol. V, Bk. X, 896 a 1-2. Aristotle says in *De Anima*, vol. I, Bk. I, ch. 3, 406 a 2 that the soul is not self-moving, though it is the principle of living things. His definition of the soul as the first act of a physically organized body having life in potency is found in *De anima*, vol. I, Bk. II, ch. 1, 412 a 27, 412 b 5.

soul[4] are reproduction, nutrition, growth, and decay. None of these seems to account for the movement of the heart. This soul is found also in plants; the movement of the heart, however, is characteristic of animals.

3. The movement does not seem to belong to either the sensitive or the intellectual soul because the intellect and the senses move only by means of desire, while the movement of the heart is involuntary.[5]

4. This movement does not seem to be a natural[6] one either, since it goes now in this direction, now in that, for it consists of a push and a pull, whereas natural movement extends in one direction, as fire tends only upwards and earth downwards. It is, however, completely unreasonable to say that the movement of the heart is a violent[7] one, for it is plain that when this movement ceases, the animal ceases or dies, whereas nothing that is contrary to a thing's nature preserves it. Indeed, it appears that this movement is entirely natural, for the life of the animal and this movement are inseparably related to one another.

5. But some say that this natural movement flows not from some determinate nature within the animal, but from some universal nature, or from an intelligence.[8]

6. But this is ridiculous. In all natural things the attributes characteristic of any genus or species depend on some intrinsic principle. Those things are natural whose principle of movement resides in them. But nothing is more characteristic of animals than the movement of the heart, for when it ceases, their life perishes. It follows then that a principle of this motion resides in animals themselves.

7. Further, if some movements were produced in earthly bodies by a universal nature, they would not remain always in them, as we observe in the case of the ebb and flow of the sea which depend on the movement of the moon and vary in accord with it. But the movement of the heart

[4] Plato speaks of three parts or functions of the soul in *Republic,* vol. IV, Bk. IV, 435 c 5 and in *Phaedrus,* vol. II, 246 a 6—257 a 2. He identifies them in *Republic,* Bk. IV, 439 d 5, 439 d 8 & 439 e 3 as the rational part, the striving part, and the desiring part. Aristotle recognizes three kinds of soul, namely, the nutritive, the sensitive, and the rational in *Nichomachean ethics,* vol. II, Bk. I, ch. 13.

[5] Aristotle, *Nichomachean ethics,* vol. II, Bk. III, ch. 1, 1109 b 35, 1110 a 1 : "Those things are thought involuntary, which take place under compulsion or owing to ignorance." For Aristotle's distinction between voluntary, nonvoluntary, involuntary, and violent, *vide: loc. cit.*

[6] For the various meanings of the word 'natural' in Aquinas, *vide:* Deferrari and Barry, *A lexicon of St. Thomas Aquinas,* Baltimore, 1949, Fascicle IV, p. 724.

[7] *Summa theologiae,* vol. II, Pars I-II, q. 6, art. 5 c, p. 756 b : "Violence is directly opposed to the voluntary, as well as to the natural. The voluntary and the natural have this in common, that each proceeds from an intrinsic principle, but the violent proceeds from an extrinsic principle."

[8] I.e., an immaterial substance. This use of the word 'intelligence' is explained in *Summa theologiae,* vol. I, Pars I, q. 79, art. 10 c, p. 491 b: "In some works translated from the Arabic, the separate substances, which we call angels, are called intelligences, perhaps because such substances are always exercising the act of understanding." The medical opinion referred to in Thomas' *De motu cordis* depends perhaps on the philosophical doctrine of Avicenna. Thomas says, *ibid.,* vol. I, Pars I, q. 65, art. 4 c, p. 399b: "Avicenna and certain others did not hold that the forms of corporeal things subsist essentially in matter, but in the intellect only."

is always present in the animal. It does not then depend only on a separated cause but on an intrinsic principle.

8. Others say that the principle of this movement in the animal is heat which, generated through a spirit, moves the heart. But this is unreasonable. That which is prior in a thing must be the cause. Now the movement of the heart seems to be prior in the animal and more closely related to life than any alteration in heat. Therefore alteration in heat is not the cause of the movement of the heart, but on the contrary the movement of the heart is rather the cause of this alteration. Hence the Philosopher says in his book, *The Movement of Animals*:[9] "Movement must come first, not such and such an alteration."

9. Likewise, a perfect animal, which is one that moves itself, resembles most of all the entire universe. Hence man, who is the most perfect of animals, is called by some a world in miniature.[10] Now the first movement in the universe is local movement,[11] which is the cause of alteration and of the other movements. Hence in the animal also local movement seems more the principle of alteration than the converse. Hence the Philosopher, pursuing this analogy, says in the eighth book of the *Physics*[12] that movement is, as it were, a kind of life that is naturally present in everything that exists.

10. Further, that which exists essentially is prior to that which exists accidentally. Now the first movement of an animal is the movement of the heart; heat, however, causes local movement only in an accidental way; for it is of the essence of heat that it alter, but it is accidental to it that it cause local movement. It is then ridiculous to say that heat is the principle of the movement of the heart, but we must assign to it a cause which can be essentially the principle of local movement.

11. Therefore let us take as the principle of our contemplation what the Philosopher says in the eighth book of the *Physics*,[13] "We say that those things that have a principle of movement within them are moved naturally. Hence an animal as a whole moves itself in a natural way, but it happens that its body can be moved both naturally or in a way that is contrary to its nature. It depends on the nature of the movement and the nature of the elements of which the body is composed." For when an animal is moved downwards, its movement is natural both to the whole animal and to its body by the fact that in the body of the animal the heavy element, which by nature moves downwards, is predominant. But when an animal is moved upwards, the movement is natural to the animal because it proceeds

9 Aristotle, *The movement of animals*, vol. I, ch. 10, 703 a 24-25.

10 Cf. Democritus, fragment 34, in *Die Fragmente der Vorsokratiker*, H. Diels, Ed., vol. II, Berlin, 1956, p. 153. Also Aristotle, *Physics*, vol. I, Bk. VIII, ch. 2, 252 b 26. *Summa theologiae*, vol. I, Pars I, q. 91, art. 1 c, p. 563 a: "Man is called a little world, because all the creatures of the world are in some way found in him."

11 Cf. Aristotle, *Metaphysics*, vol. II, Bk. XII, ch. 7, 1072 b 9, 1073 a 12.

12 Aristotle, *Physics*, vol. I, Bk. VIII, ch. 1, 250 b 14-15.

13 *Ibid.*, vol. I, Bk. VIII, ch. 4, 254 b 16-20.

from its intrinsic principle, which is the soul; but it is not natural to a heavy body; hence in this movement the animal becomes more tired.

12. Local movement in animals is caused by desire and by sensitive or intellectual cognizance, as the Philosopher teaches in the third book of the *De Anima.*[14]

13. In other animals, then, the entire process of movement is natural; for they do not act by purpose, but by nature; for the swallow makes its nest and the spider its web in a way that is natural.[15] It is characteristic of man alone to act by will, and not by nature.

14. Nevertheless the principle of any of his acts is a natural one. For although he does not naturally know the conclusions of the speculative and practical sciences, but discovers them by reasoning, the first indemonstrable principles, from which he goes on to knowledge of other things, are naturally known to him. Likewise, it is natural for man, led by desire, to seek the ultimate end,[16] which is happiness, and to flee misery. It is not natural for him to seek other things, but because of his desire for the last end, he goes on to desire other things. Thus the end is related to things desirable as the indemonstrable principle is to things intellectual, as is said in the second book of the *Physics.*[17] Since then the movement of all the other members is caused by the movement of the heart, as the Philosopher shows in the book, *The Movement of Animals,*[18] other movements can be voluntary, but the first movement, which is that of the heart, is natural.[19]

15. Now let us take into consideration that upward movement is natural to fire because it results from its form; hence also the efficient cause, which produces the form, is essentially one that causes local movement. Just as any natural movement results from the form of the element, so also nothing keeps other natural movements from proceeding from other forms. We see that iron naturally is moved towards a magnet, although this is not a movement natural to it inasmuch as it is heavy or light, but inasmuch as it has such and such a form. Therefore nothing keeps an animal, inasmuch as it has a certain kind of form which is the soul, from having a natural movement; and that which is causing this movement is that which accounts for the form.

16. Now I say that the natural movement of the animal is that of the heart because, as the Philosopher says in the book, *The Movement of*

[14] Aristotle, *De anima,* vol. I, Bk. III, ch. 10, 433 a 9–b 30.

[15] Cf. Aristotle, *Physics,* vol. I, Bk. II, ch. 8, 199 a 26.

[16] *Summa theologiae,* vol. I, Pars I, q. 18, art. 3 c, p. 128 b: "Although our intellect moves itself to some things, yet others are supplied to it by nature, as are first principles, which it cannot doubt; and the last end, which it cannot not will."

[17] Aristotle, *Physics,* vol. I, Bk. II, ch. 9, 200 a 15-25.

[18] Aristotle, *The movement of animals,* vol. I, ch. 10, 703 a 14.

[19] *Summa theologiae,* vol. II, Pars I-II, q. 17, art. 9, ad 2, p. 809 a: "In bodily movements the principle is according to nature. But the principle of bodily movement proceeds from the movement of the heart. Therefore the movement of the heart is according to nature, and not according to will."

Animals,[20] "an animal must be regarded as resembling a state that is well and lawfully governed. For when order is once established in a state, there is no need of a special overseer to supervise every activity, but each man does the work assigned him, and one task succeeds another in an accustomed order. In animals this same thing takes place by nature, and because each of the organs is naturally suited to execute its own function, there is no need for the soul to be in each part as the principle of movement but it is in some principal part[21] such as the heart which gives life to the other parts, for they execute naturally their own functions."

17. Therefore the movement of the heart is natural because it results from the soul, inasmuch as it is the form of one particular body[22] and primarily of the heart.[23]

18. And perchance because of this notion some have said that the movement of the heart comes from an intelligence, as the Philosopher says in the eighth book of the *Physics*[24] that the movement of heavy and light bodies comes from an efficient cause inasmuch as it gives the form which is the principle of movement. Now every property and movement proceeds from some form according to its rank, as movement to the noblest place which is above results from the form of the noblest element, namely, fire. But the noblest form that exists in earthly bodies is the soul, which resembles most of all the principle of movement of the heavens. Hence the movement that results from it is most like the movement of the heavens. Thus the movement of the heart in the animal is like the movement of the heavens in the world.

[20] Aristotle, *The movement of animals*, vol. I, ch. 10, 703 a 14.

[21] Thomas does not oppose Aristotle on this point for he interprets him as referring here not to the essence of the soul but merely to its power of originating movement. Cf. *Summa theologiae*, vol. I, Pars I, q. 76, art. 8, ad 1, p. 462 a. Also Aquinas, *Summa contra Gentiles*, Bk. II, ch. 72, vol. XIII, p. 457.

[22] Thomas argues in *Summa theologiae*, vol. I, Pars I, q. 76, art. 1 c, p. 447 b that the soul is the form of the body. As a consequence of this, man has but one soul. Cf. *ibid.*, vol. I, Pars I, q. 76, art. 3 c, p. 453 b.

[23] Thomas does not mean that the soul resides in the heart as its *domicilium*. Its being the form of the body precludes this. Because the soul is not united to the body as its mover, as in Platonic psychology, it does not act on the body through an organ, but is whole and entire in each and every part of the body. *Vide: Summa theologiae*, vol. I, Pars I, q. 76, art. 8 c, p. 461 b. Thomas' thinking is in accord with St. Augustine who says in *De trinitate*, Bk. VI, 6, 8 that the soul is "wholly in the whole body, and whole in each part of it." Migne, *Patrologia latina*, t. XLII, Paris, 1841, p. 929. However, Thomas departs from the teaching of his master, St. Albertus Magnus, who adopted the opinion of Alfred of Sareshel. Alfred in his *De motu cordis*, written about 1210, says: "The heart is the dwelling-place (*domicilium*) of the soul." "Des Alfred von Sareshel (Alfredus Anglicus) Schrift de Motu Cordis" von Clemens Baeumker in *Beiträge zur Geschichte der Philosophie des Mittelalters*, Band XXIII, Münster i. W., 1923, ch. VIII, p. 33. Albert in *De anima*, II, tract. I, ch. 7, says: "The soul is in the heart, and from there it pours out its powers on the whole body, and so it is not wholly in the whole body, in such a way that it would be whole in each part, but it is in each part by some of its powers. . . . And this is the opinion of the Peripatetics. But there were and are certain men still who say that the soul is wholly in the whole body, but this was not the opinion of a certain Philosopher." *Opera omnia*, A. Borgnet, Ed. Paris, 1890, vol. 5, pp. 204-205. By "a certain Philosopher" Albert indicates his debt to Alfred.

[24] Aristotle, *Physics*, vol. I, Bk. VIII, ch. 4, 255 b 31—256 a 3.

19. But the movement of the heart necessarily falls short of the movement of the heavens as the effect falls short of the cause. The movement of the heavens is circular and continuous, and this is appropriate to it inasmuch as it is the principle of all the movements of the world; for by approach and recession a heavenly body confers on things the origin and end of being, and by its continuity preserves order in the movements that are not eternal. The movement of the heart is the principle of all the movements that exist in the animal. Hence the Philosopher says in the third book of *The Parts of Animals*[25] that "the movements of delight and sadness and, in general, all the emotions seem to begin here," namely, in the heart, and to end here. Therefore in order that the heart be the principle and end of all movements in the animal, it has a certain movement, not circular but like circular movement, namely, one consisting of a push and a pull. Hence the Philosopher says in the third book of the *De Anima*[26] "that which moves instrumentally is found wherever a beginning and an end coincide. All things are moved by pushing and pulling; because of this something must remain at rest, as we see in the case of the wheel, and motion must originate from this position."

20. This movement is continuous throughout the life of the animal, except that a rest period is inserted midway between the push and the pull[27] because it falls short of circular motion.

21. By this principle then we can easily solve the objections of an adversary.

22. For we do not say that the movement of the heart is natural to it inasmuch as it is heavy or light, but inasmuch as it is animated by a certain kind of soul; and the two movements which seem opposed are, as

[25] Aristotle, *The parts of animals,* vol. I, Bk. III, ch. 4, 666 a 11-13.

[26] Aristotle, *De anima,* vol. I, Bk. III, ch. 10, 433 b 21-22, 25-27.

[27] Modern physiologists do not speak of a rest period between systole and diastole; but within diastole, which is itself the resting phase of the ventricle, there are periods of inactivity such as those of isometric relaxation and diastasis. *Vide:* Best and Taylor, *The living body,* New York, 1958, pp. 169-173. In *Summa theologiae,* vol. II, Pars I-II, q. 44, art. 1, *sed contra,* p. 943 b, Thomas cites the definition of fear given by St. John of Damascus (c. 674-749) in which the word 'systole' appears. John says in *De fide orthodoxa,* Bk. III, ch. 23, 1088: "Natural fear is a force which maintains being by means of *systole.*" Migne, *Patrologia Graeca,* t. XCIV, Paris, 1864. John had taken over this definition from the work of Maximus the Confessor (580-662), *Disputatio cum Pyrrho,* 297 D. Migne, *Patrologia Graeca,* t. XCI, Paris 1865. As used here, the word 'systole,' which we can translate by 'retreat' or 'contraction,' lacks medical significance. But in the *De motu cordis* of Alfred of Sareshel we find specifically medical meanings attributed to 'systole' and 'diastole.' However, they are used only with reference to the arteries. He first gives the explanation of those who speak of a spirit flowing through the arteries: "They say that diastole results when the arteries are full and stretched by the spirit that flows through them; systole results when it leaves the arteries." *Op. cit.,* ch. 11, p. 46. He then gives the explanation of those who oppose the doctrine of the flowing spirits. According to this group, "Radiation causes diastole; its cessation causes systole." (*op. cit.,* ch. 11, p. 47). Thomas in *Summa theologiae* (vol. II, Pars I-II, q. 24, art. 2, ad 2, p. 850 b) uses these terms in reference to cardiac activity: "In every emotion of the soul there is an increase or decrease in the natural movement of the heart according as the heart is moved more or less intensely in systole or diastole."

it were, parts of a single movement composed of both, in so far as it falls short of the simplicity of circular movement, which it imitates in so far as it goes from a point back to the same point. And so it is not contradictory if it goes somehow in different directions, because circular movement also is in some respects like this.

23. Nor must it be caused by apprehension and desire, although it comes from the sensitive soul;[28] for it is not caused by the sensitive soul through its own operation, but inasmuch as it is the form and nature of one particular body.

24. The locomotion of the animal is caused by the operations of the senses and the emotions; and because of this medical men distinguish vital operations from animal operations, and say that when the animal ones cease, the vital ones remain. They call vital those operations which accompany the movement of the heart, for when they cease, life is at an end; and this is reasonable. For "to live" is the "to be" of living things, as is said in the second book of the *De Anima*:[29] the "to be" belongs to each thing in virtue of its own form.

25. There is this difference between the principle of movement of the heavens and the soul: this principle is moved neither essentially nor accidentally; but the sensitive soul, although not moved essentially, is moved accidentally. Hence diverse cognitions and emotions arise in it. Hence the movement of the heavens is always uniform but the movement of the heart varies according to the diverse emotions and cognitions of the soul. For the emotions of the soul are not caused by the modifications of the heart but rather cause them.[30] Therefore in the passions of the soul, as for example in anger,[31] the formal element is that which comes from the

[28] Thomas here tacitly concedes that the heart is moved neither by the nutritive nor by the intellectual soul but maintains that its movement is caused by the sensitive soul. He is challenging the statement of an adversary as presented in paragraph 3, *supra*. It is easy to take paragraph 3 for Thomas' own position, since this *opusculum*, being a letter, does not exhibit the clearly defined didactic structure of Thomas' major works. Dr. Walter Pagel in his splendid article (*loc. cit.* [see note d]) seems not to have avoided this snare, for he writes of Thomas: "The author first analyses the relationship between the heart and the soul. To start with he rejects the possibility that individual faculties of the soul cause the movements of the heart: plants possess a nutritive, augmentative, and generative soul, but no heart. Nor are the sensitive or intellectual faculties responsible, since the heart moves involuntarily" (p. 141) and "The motion of the heart cannot be explained in terms of action by any force outside the organism, or even any partial faculty of the soul" (p. 142).

[29] Aristotle, *De anima*, vol. I, Bk. II, ch. 2, 413 b 1-2.

[30] *Summa theologiae*, vol. II, Pars I-II, q. 38, art. 5, obj. 3, 922 b: "Sorrow and pain, in so far as they affect the body, bring about a certain change in the heart." Also, *loc. cit.*, ad 3, p. 922 b: "Every good disposition of the body reacts in some way on the heart, as on the principle and end of bodily movements"; *ibid.*, vol. I, Pars I, q. 20, art. 1, ad 1, p. 144 a: "The act of the sensitive appetite is always accompanied by some change in the body, especially in the heart, which . . . is the first principle of movement in animals."

[31] *Summa theologiae*, vol. II, Pars I-II, q. 48, art. 2 c, 962 b: "The movement of anger produces fervor of the blood and spirits about the heart, which is the instrument of the soul's emotions. And hence it is that, because of the great disturbance of the heart when one is angry, certain signs are especially evident in the exterior parts of those who are angry."

will, namely, the desire for vengeance; but the material element[32] is what pertains to the movement of the heart, namely, the excitement of blood about the heart.

26. In natural things the form does not exist for the sake of the matter, but conversely, as is made clear in the second book of the *Physics;*[33] but in matter there is disposition for form. Therefore it is not because the blood about the heart is excited that someone seeks vengeance, but because of this someone is inclined to anger.[34] He becomes angry, however, out of desire for vengeance.

27. Although some variation in the rhythm of the heart occurs due to diverse apprehensions and emotions, this variation of rhythm is not voluntary but involuntary, because it does not take place at the command of the will. For the Philosopher says in the book, *The Cause of the Movement of Animals,*[35] that often at the sight of something the heart and genitals are moved without a command of the intellect, and he gives this reason: that animals necessarily are affected by physical changes; but when the parts are affected, one undergoes increase, and another decrease, so that each is moved and modified by natural changes that are related to one another.

28. The causes of the movements of the animal are warmth and cold,[36] which, naturally present internally and externally, make the movements of the aforementioned parts, the heart and genitals, take place in any case independently of reason when an alteration occurs.[37] The intellect and imagination cause emotion, such as concupiscence, anger, and the like on account of which the heart grows warm or becomes chilled.[38]

29. Let these words on the movement of the heart suffice.

[32] *Ibid.*, vol. II, Pars I-II, q. 22, art. 2, ad 3, p. 843 b: "In the definitions of the movements of the appetitive part some natural change of an organ is found from the standpoint of matter; as it is said that "anger is the excitement of the blood about the heart." Also, *ibid.*, vol. I, Pars I, q. 20, art. 1, ad 2, p. 144 a: "Let us distinguish in the emotions of the sense appetite a certain material element, namely the bodily change, and a certain formal element, which belongs to appetite. Thus in anger . . . the material element is the excitement of the blood about the heart, or something like this; but the formal element is the desire for revenge."

[33] Aristotle, *Physics,* vol. I, Bk. II, ch. 9, 200 a 30-34.

[34] *Summa contra Gentiles,* vol. XIII, Bk. I, ch. 89, p. 240: "Every emotion comes about concomitantly with some bodily change: for example, concomitantly with the contraction or dilation of the heart, or something like this."

[35] Aristotle, *The movement of animals,* vol. I, ch. 11, 703 b 7-20.

[36] This is explained in *Summa theologiae,* vol. II, Pars I-II, q. 6, art. 1, ad 2, p. 753 a.

[37] A discussion of this is found in *ibid.*, vol. II, Pars I-II, q. 17, art. 9, ad 3, p. 809 b.

[38] Cf. *ibid.*, vol. II, Pars I-II, q. 44, art. 3, ad 3, p. 945 b, where Thomas illustrates the chilling effects of fear: "Because in fear heat leaves the heart, and goes from the higher parts to the lower, the heart especially trembles in those who are afraid, and the members which are connected to the chest, where the heart resides, also tremble. Hence the fearful tremble especially in their speech, because the artery of speech is near the heart. The lower lip, and the entire lower jaw, because of their connection with the heart, also tremble. Because of this, the teeth chatter. For the same reason, the arms and hands tremble."

Antiques of Interest to the Apothecary

T. G. H. DRAKE*

IN the following paper are illustrated and described various antique objects pertaining to the ancient and honourable profession of pharmacy. These articles, from our collection of antiques of medical and paediatric interest, have been acquired gradually over the past 25 years and are specimens such as are still available to the individual collector. In Figure 1 is shown a Sevres porcelain statuette, *circa* 1800, marked in gold beneath the base, "L'Apothecaire." From this will be seen that in the 18th century the compounding and dispensing of drugs was not the sole work of the apothecary, he also administered enemas. The size of the pewter syringe which he holds in his hands is not exaggerated. An 18th century English enema syringe in our collection of medical pewter weighs 6 pounds, is 4 inches in diameter, and the length with plunger extended is 2½ feet.

English Delftware

Delftware is a "tin enameled" white pottery which could be decorated in bright colours. This ware was of Near Eastern origin and passed through the Hispano-Moresque pottery of Malaga and Valencia to the Maiolica of Italy and reached England from Holland about the year 1550. It soon supplanted the brown and green potteries, the only colours previously available to the English potter. Though usually known as Delft pottery due to the reputation acquired by that Netherlands city for its manufacture, this is a misnomer since the ware was being made in England before its production started in Delft. In the making of delftware a clayware blank quite similar in porosity and colour to a modern flower pot was first produced by fashioning and firing. This blank was washed with a watery suspension of a very finely ground compound of tin oxide fused with lead oxide and glass. On the white friable surface left after the absorption of the water the design was painted, most frequently with an oily suspension of cobalt which produced the typical delft blue colour. Occasionally manganese (purplish black), copper (green), iron (brick red), or antimony (yellow) colours were employed. After decoration the article was subjected to a second firing at a high temperature.

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That delftware was employed by the apothecaries soon after its introduction into England is shown by a petition, in the year 1567, addressed to Queen Elizabeth I by two Antwerp potters in which they stated that they had great trouble in finding suitable materials for making tin enamel "pavingtiles and vessels for apothecaries and others." The manufacture of delftware declined in Great Britain in the late 18th century, it being supplanted by the cream-coloured lead-glazed earthenware which had been perfected by Wedgwood and which gained fame under the name "Queen's Ware."

Among the delftware still surviving are drug jars, dispensing pots, and pill slabs. Drug jars were produced in globular form, on stand, equipped with spout for the reception of syrups and oils, and as cylindrical and squat jars for powders, pills, ointments, and confections. Through comparison of the style of decoration of undated specimens with that of the few surviving dated examples, age can be rather closely determined in most instances. Excellent illustrations of dated English drug jars can be found in the book, *Early English Drug Jars* by G. E. Howard (London Medici Society, 1931) and in the more recent publications of Agnes Lothian, Librarian of the Pharmaceutical Society, London, who is the present-day authority on these jars. To obtain knowledge of the composition and use of the drugs inscribed on the jars the collector should obtain one or more of the 18th century English Dispensatories; copies of these can be found listed in most catalogues of old medical books at prices ranging from three to ten dollars.

In Figure 2 are shown typical examples of delftware drug jars dating from 1650 to 1800. The first English drug jars inscribed with the names of drugs were manufactured about 1650. Before that time unlabeled jars decorated in cobalt blue with rings or stripes (2A), had been produced. Jars made before the Great Fire of London in 1666 are very rare because of the destruction of a high proportion of the wealthy apothecary shops at that time. From 1660 to 1700 an angel's head between outstretched wings was frequently incorporated in the design while 18th century specimens are decorated with birds, cherubs, and cockle shells. Jar 2B, 1666, is the only example inscribed with a date in our 36 pre-1800 specimens. The leech jar (Fig. 3) is not delft but cream ware *circa* 1800. Leech jars are really difficult to obtain, since a pharmacy, while containing many drug jars, would possess only one or two containers designed for storing leeches. Prices obtained for delftware drug jars at London auctions have taken a marked upswing

recently—happily after our search for these articles had been stopped by unavailability of further space for their display.

Through the opening of old refuse dumps in the course of building operations in the City of London, many ointment dispensing pots (Fig. 4) have been discovered. Of the 38 in our collection all are delft of the 17th and 18th century with the exception of the upper left specimen illustrated which is late 16th century and the lower right which is saltglaze 18th century. Their capacity varies from one teaspoon to four fluid ounces; the majority bear no decoration. Quite a number dating from the Great Plague retain the greater portion of the original ointment. While this might be interpreted as revealing the great curative powers of the remedy, it is much more probable that it resulted from the death of the patient or a rapid switch to some other treatment. The new therapy might have been that recommended for the treatment of the plague in 1636 by Francis Herring, "D. in Physicke and Fellow of the Colledge of Physitians in London": "But if any be in that extreamitie of povertie and misery, that they cannot procure these parable and easie cheape medicines, let them drinke twice in the day, a draught of their owne urine in the morning, and five in the after-noone."

Pill slabs (Fig. 5) are of particular interest since these tiles are decorated with the armorial bearings of the "Worshipful Society of Apothecaries."[1] Though the apothecaries had been granted a charter by James I in 1606 they were still united with the Grocers' Company. In 1617 they were separately incorporated, being granted the sole right to "make, mix, compound, prepare, give, apply or administer any medicines," and it was made unlawful for the grocers "or any Persons to use or exercise the Art, Faculty or Mystery of an apothecary within the city of London or within seven miles of the City." The charter also gave the Society the right to search the shops and cellars where the art of the apothecary was exercised and to examine the stock for adulterated drugs. The arms of the Society, granted in 1617, were described as follows: "In a shield, Appollo, the inventor of physic, with his head radiant, holding in his left a bowe and in his hand an arrow, supplanting [astride] a serpent, above the shield a helm therupon a mantle, and for their crest upon a wreath of their colours, a Rhynoceros, supported by two unicorns, armed, upon a compartment to make the achievement compleat, this motto, Opiferque Per Orbem Dicor." This can be translated as 'I am called Help-Bringer

[1] Lothian, Agnes. The Armorial London Delft of the Worshipful Society of Apothecaries. *The Connoisseur*, 1951, *127*, 21.

throughout the world.' The motto was derived from Ovid's story in which Apollo, in telling Daphne who he is, says: "The art of medicine is my discovery I am called Help-Bringer throughout the world and all the potency of herbs is given unto me." These pill slabs are perforated for suspension, and it is extremely probable that they were hung in the pharmacy as visual evidence that the owner was a liveryman of the Apothecaries Society, rather than that they were used for the compounding of pills and ointments. The octagonal forms are about twice as common as the shield shape. On about one-third the arms of the City of London are added (Fig. 5C). In practically all examples the decoration is cobalt blue, sometimes with the motto in black. Extremely rare polychrome specimens exist in which the other colours available to the delftware potter have been incorporated.

Mortars

Though mortars are now rather specifically associated with the pharmacist, this was not the case in olden days. Then, households required a mortar for powdering spices, loaf sugar, etc., even the church employed one for the preparation of incense. Mortars[2] have been fashioned of many different materials—stone, bronze, brass, ivory, and wood. The bell metal specimens (Fig. 6) were cast in bell foundries from mixtures of copper with tin or zinc; occasionally in the heavier specimens lead was added. Some specimens are dated: the lower right example bears the date 1497; others bear the maker's or owner's name. Many have handles for holding in the hand or fixing on a bench. Old specimens frequently show an outward bulging of the base produced by the long pounding of the pestle. Specimens should not be submitted to polishing but should be allowed to retain their surface patina. One may even consider using later plain specimens as ash trays, being careful to affix to the bottom a couple of strips of adhesive plaster or a round of felt to prevent scratching the surface of furniture.

Numismatics

The whole of one's collecting energy might readily be devoted to coins, tokens, and medals associated with the apothecary (Fig. 7). Many gold, silver, and copper coins,[3] ranging from Greek of the 5th century B.C. to Roman of the 1st century B.C. bear the face of Apollo (Fig. 7, No. 67) whose figure was incorporated later in

2 Peck, E. Saville. Bell-mortars. *Chemist and Druggist*, 28 June 1952, p. 890.
3 Glendenning and Company, London. Coin auction sale catalogue, 31 January 1951.

the armorial bearings of the Society of Apothecaries. He was the Greek and Roman deity of light, music, poetry, archery, and healing, the father of the Greek Asklepios who was later brought to Rome under the Latinized name Aesculapius and who eventually overshadowed Apollo in the healing arts.[4] Apollo was both a bringer and an averter of disease but the active healing was delegated to Asklepios. In recognition of Apollo's divine assistance in staying the pestilence of 433 B.C., a temple was built for him in Rome. In a hymn he is spoken of as a teacher:

> And wise physicians taught by him delay
> The stroke of fate and turn disease away.

Horace addressed him:

> Thou who restoreth with thy healing art
> The weakened limbs of the body.

Those who sought his aid addressed him as Apollo Salutaris et Medicinalis. The details of the actual administration of medicines were entrusted to Vestals who gave medicines in a state of nudeness, since nudity was believed to be a magical preventative. One can imagine the shock which would occur were a pharmacist of today to find incorporated in a prescription, Sig. To be administered by a naked virgin who while touching the patient with the back of her hand says, "Apollo forbids a disease to increase which a naked virgin restrains."

Copper and silver coins dating from 300 to 200 B.C. may be obtained on which are shown various medicinal plants including the poppy (Papaver Somniferum L.), the pomegranate (Punica Granatum L.), storax (Styrax Offinicalis L.), and the long extinct wild desert plant silphium (Fig. 7, No. 312). Silphium was used as a drug and seasoning and its export produced much of the wealth of ancient Cyrene in Africa.

In Great Britain from 1644 to 1672 no official minor copper currency was issued. "For necessary change" from 1649 to 1672 about 10,000 varieties of token farthings and half-pence were issued by tradesmen, corporations, and others. This illegal money, the small change of the period, of necessity was redeemable by the issuer on demand. Storer[5] lists 121 of these tokens issued by apothecaries. Of the 114 specimens, including duplicates, in our collec-

[4] Jayne, W. A. *The healing gods of ancient civilization.* New Haven, Yale University Press, 1925. 569 pp.

[5] Storer, H. R. *Medicina in nummis.* Boston, Wright and Potter Printing Company, 1931.

tion—quarter-pennies and half-pennies—70 per cent show Apollo slaying the dragon of disease as portrayed on the pill slabs (Fig. 7, No. 9), 13 per cent show mortars, 10 specimens without handles, 4 with two handles, and one bearing a single handle. Again in the late 18th century among approximately 7,000 varieties of token coins then struck in Great Britain[6] are included four varieties issued by regular pharmacists and others issued primarily for advertising purposes by the quack practitioners Swainson, Ching, Guest, and Burchell. The obverse of Swainson's half-penny (Fig. 7, No. 907) shows his bust and the name J Suainson. The misspelling of his name probably accounts for the great rarity of this token. The reverse pictures a female dropping herbs into a still and the legend "Hygeia preparing Velnos' vegetable syrup." Swainson's de Velnos vegetable syrup was a venereal remedy, also "of value in gout, rheumatism, palsy, apoplexy, impotency, barreness, scrofula, consumption, scurvy, etc," for which claims were made in booklets that "In the veneral [sic] disease, it has never failed."

Ching's patent Worm Lozenges were jalap and mercurial purgatives. Ching's token shows his bust surrounded by the wording: I Ching patentee for worm lozenges the best medicine in the world. Sold in boxes at 3/6. Packets 1 s. and in small packets at 6 d.each." The reverse bears the Royal Arms, supporters, crest, and motto and the legend: "By every principal medicine vender in the Kingdom." Barnett Guest's token shows the Royal Arms, supporters and crest and a boot, shoe and lady's slipper with the legend "Guests patent boots and shoes—No. 9 Surrey at Black Friars Road, Halfpenny 1795." Guest's advertisement in the newspaper, *The Sun*, 27 August 1794, reads: "Old boots regenerated. By a method entirely new, under the direction of Barnett Guest, chymist. . . . Inventor and maker of Guest and Co's patent elastic boots, patent shoes, patent triangular buckles and patent soles." Guest had gained his knowledge of medicine by serving an apprenticeship with a Birmingham chemist and carried on the profession of quack doctor from the same address as his shoe business. Guest's successor, J. Hammond, advertised in a newspaper of 1838: "Guestonian pills and lotion. Established forty-four years, for the cure of gout, rheumatism, rheumatic fever, head-ach, lumbago, sciatica, old sprains & C. & C. . . ." Of Basil Burchell's token, 19 die varieties are recorded by Dalton and Hamer[6] of which we possess 18, including the extremely rare error in which the address is given as No. 78. The obverse

[6] Dalton, R. and Hamer, S. H. *The provincial token-coinage of the 18th century.* 1913. 567 pp.

legend is "Basil Burchell sole proprietor of the famous sugar-plumbs for worms No. 79 Long-acre," the reverse, "Basil Burchell sole proprietor of the anodyne necklace for children cutting teeth." Burchell also manufactured "Remedies in secret cases." An advertisement of the anodyne teething necklace in *The Times*, 1807, claimed that "After wearing of which but one night, children have immediately cut their teeth with safety, who just before were on the brink of their grave with their teeth, fits, fevers, convulsions, gripes, looseness & C. all proceeding from their teeth, and have almost miraculously recovered; price 6s. . . . To avoid counterfeit shops in the neighborhood, the public are desired to copy the name Basil Burchell." Nineteenth century English small advertising medals can also be obtained such as that advising "Try Lerro's charcoal compound or Live Long for indigestion bile spasms & C.," and one, dated 1840, advertising Dr. Stuart's, Glasgow, "Panacea."

Medicine Spoons

Various spoons (Fig. 8) have been fashioned specifically for the administration of medicine. While latten (brass) spoons, *ca.* 1500, with horse hoof-shaped ends and small fig-shaped bowls (8A), were considered by Norman Gask to be specifically medicine spoons, the late Commander G. P. Howe, the authority on antique English spoons, stated in a personal communication that there was no proof of this. The sterling silver specimen (8F), Edinburgh, *ca.* 1800, and the silver-plated Britannia metal example (8D), *ca.* 1830, would be very useful in preventing spilling of liquid medicines as also would be the rather common porcelain and pottery partially covered, footed specimens such as Figures 8G and 8H, late 19th century. Specimens 8C and 8E, *ca.* 1830, rather common in pewter, were designed specifically for administering liquid medicines although occasionally larger specimens are discovered with a tip opening which has been enlarged for feeding thin pap to the infant. These spoons were filled through the trap door, the flow being controlled by pressure of the finger on the end of the tubular handle which opens into the bowl. Without doubt when exasperated the administrator frequently blew down the handle. Question—how often did the struggling recipient blow first? In pewter and Britannia metal these tubular handled medicine spoons are encountered in capacities of from 1 to 12 drams. Our seven sterling silver specimens all hold about one teaspoon and have hallmarks from 1827 to 1860. Example 8B, London, 1827, complete with its original red straight-grained sheepskin case, is engraved with the Prince of

Wales feathers and the legend "C. Gibson inventor 71 Bishopsgate St Within." Gibson's name as inventor is also engraved or stamped on three other specimens with hallmarks from 1828 to 1830.

Home Medicine Chest

In Figure 9 is shown a home medicine chest *ca.* 1850. This is a brass-bound locked box containing 6 four-ounce and 4 two-ounce glass-stoppered, hand-blown square bottles showing ground-down pontil marks on the base. The drawer, secured from within, contains a small hand balance and weights, a glass mortar and pestle and measuring cylinder. The brass weights, countermarked with crown and VR, range from ½ to 6 grains. The glass measure is graduated from 10 to 60 drops. In the majority of chests a "secret" compartment, to which access can be obtained through the back after release of an inner catch, is incorporated. In olden times with poor facilities for procurement of medical and pharmaceutical services these medicine chests were more common than now. Their contents were used not only within the owner's home but were administered outside by the lady of the manor, such "Generous, charitable christian Gentlewomen that have a disposition to be serviceable to their poor country neighbours, labouring under any of the afflicted circumstances mentioned; who by making the medicines, and generously contributing as occasions offer, may help the poor in their afflictions, gain their good-will and wishes, entitle themselves to their blessings and prayers, and also have the pleasure of seeing the good they do in this world, and have good reason to hope for a reward (tho' not by way of merit) in the world to come." Her textbook would probably be one of the home remedy guides which were incorporated in many early cook books, such as that in *The Compleat Housewife or Accomplish'd Gentlewomans Companion* by E. Smith (8th edition, London, 1737, 354 pp): "Being a collection of upwards of six hundred approved Receipts in Cookery, pastry. . . . To which is added, a collection of above three hundred family receipts of medicines; viz Drinks, syrups, salves, ointments and various other things of sovereign and approved efficacy in most distempers, pains aches, wounds, sores, etc. never before made publick; fit either for private families, or such publick-spirited Gentlewomen as would be beneficent to their poor neighbours." From Smith's book she could learn of "An infallible cure for the bite of a mad dog" for humans young or old, horse, bullock, sheep, hog, or dog (an extract of rue, garlic, treacle, pewter or tin filings boiled in ale); "an infallible cure for the galloping con-

FIG. 1. "L'Apothecaire," Sevres porcelain, *ca.* 1800.

FIG. 2. English delftware drug jars, 17th and 18th centuries.

Fig. 3. Leech jar, creamware, *ca.* 1800.

Fig. 4. Ointment dispensing pots, 16th to 18th centuries.

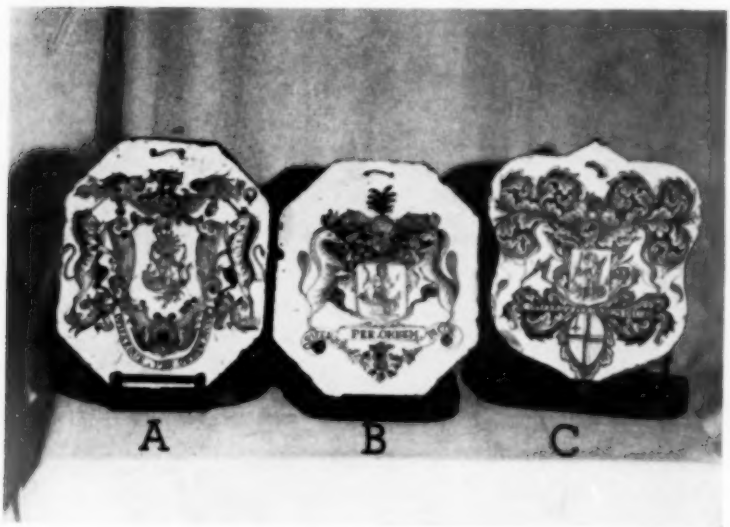

Fig. 5. Pill slabs, delftware, *ca.* 1700.

FIG. 6. Bell-metal mortars, 15th to 18th centuries.

FIG. 7. Coins and tokens, 67 Apollo, Leotini, 466-450 B.C.; 312 Silphium, Cyrene, 308-277 B.C.; 9, Apothecaries farthing token, England, 1664; 907, Swainson's token, London, *ca.* 1790.

Fig. 8. Medicine spoons

FIG. 9. Home medicine chest, *ca.* 1850.

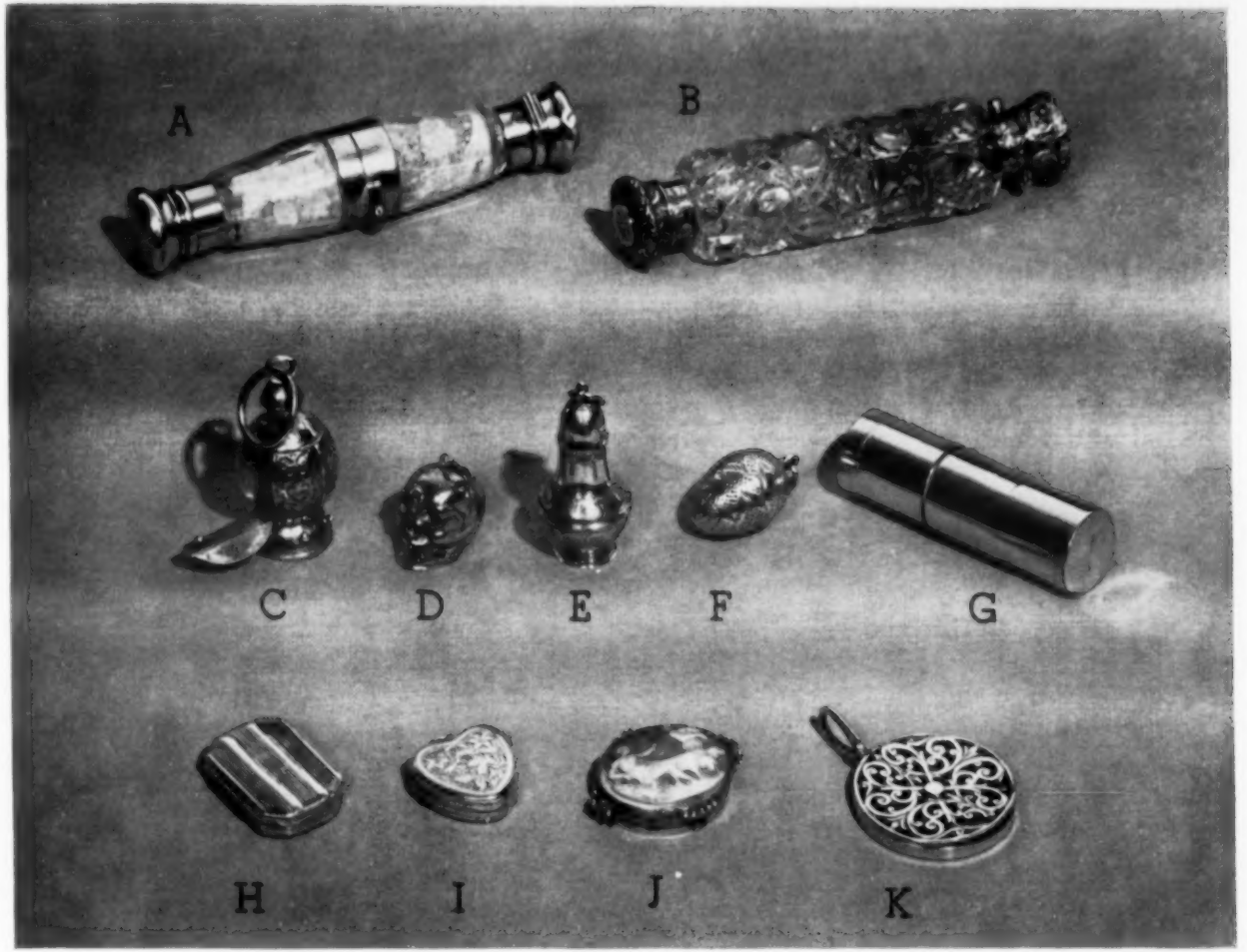

FIG. 10. Containers for aromatics "against the ill air" and pill box. (A&B) Smelling-salts bottles, *ca.* 1850. (C-F) Pomanders, 16th to 18th century. (G) Pill box, *ca.* 1800. (H-J) Vinaigrettes, *ca.* 1800. (K) Camphor locket, 19th century.

FIG. 11. Egyptian Kohl pots and mortar (lower left), *ca.* 500 B.C.

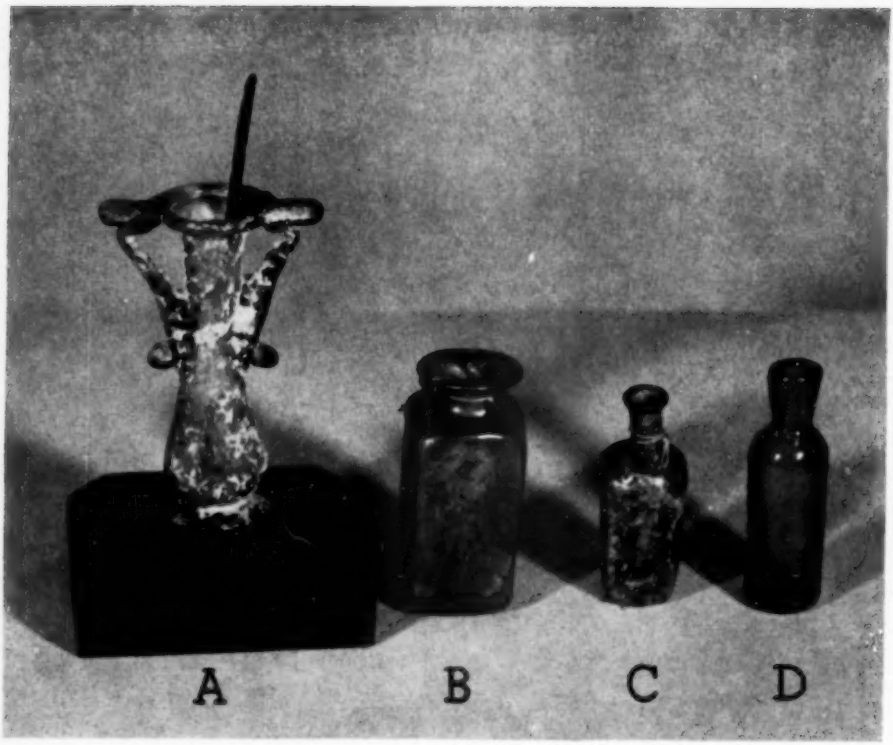

FIG. 12. Ancient glass Kohl pot (A), and Roman medicine phials.

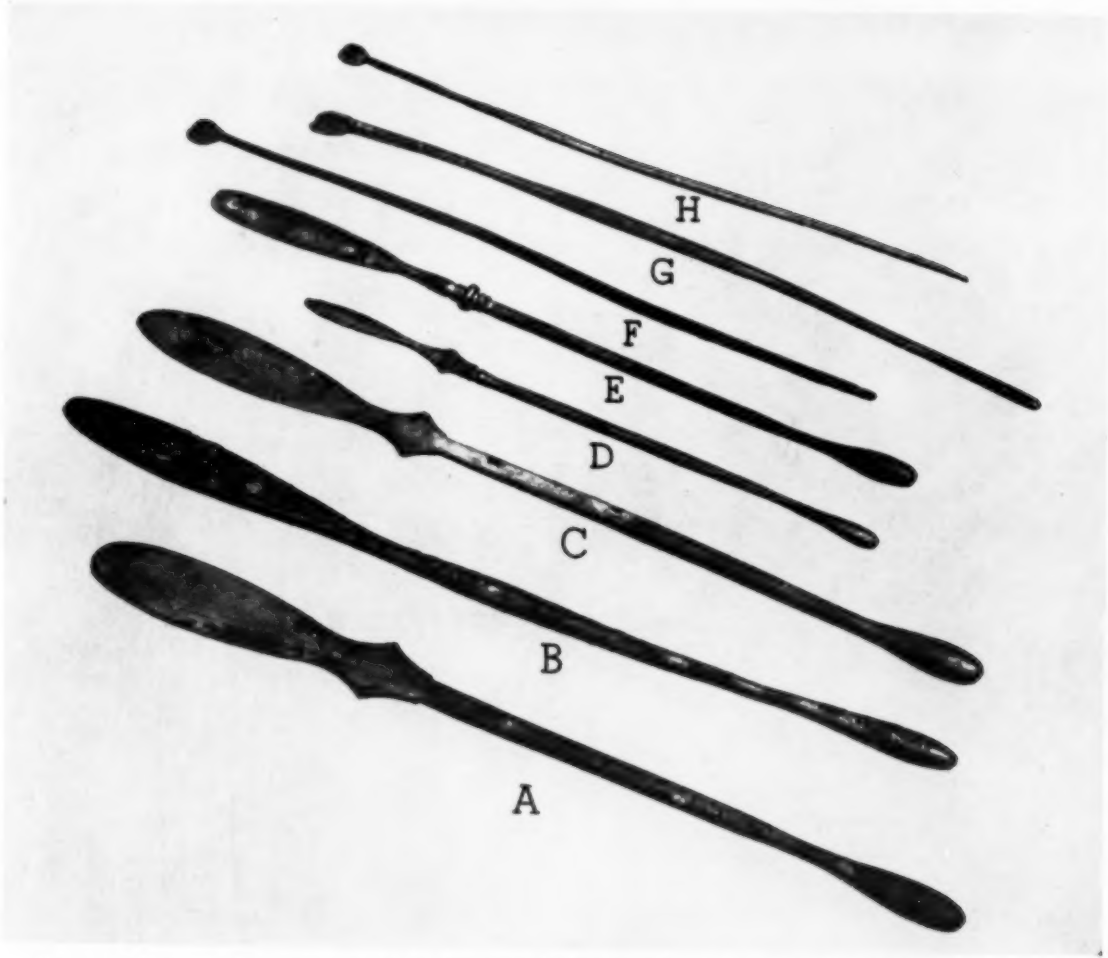

FIG. 13. Bronze pharmaceutical and cosmetic instruments, Roman, London, *ca.* 100 A.D.

Fig. 14. Medicine phials, 17th and 18th centuries.

Fig. 15. The Quack Doctor, 1815.

sumption, . . . And if this will not cure you, the Lord have mercy upon you" (a mixture of raisins, figs, honey, Lucatellus's balsam, powder of steel, flour of elecampane, grated nutmeg, and sugar), and "To cure a cancer" (powder of crabs claws made into a paste with damask-rose-water and drunk each morning, together with local application; if the tumour was raw, of a salve made of dock-roots and fresh butter). In cosmetics were included directions to make lip-salve, a remedy for pimples and an ointment to cause hair to grow. This last was composed of boar's grease, ashes of burnt bees, ashes of southerwood, juice of white lily-root, oil of sweet almonds and musk, "and the day before the full-moon shave the place and annoint it every day with this ointment it will cause hair to grow where you will have it."

Pill Boxes and Containers for Anti-infection Aromatics

Boxes such as the silver specimen, *Ca.* 1800, (Fig. 10G) designed specifically for carrying pills are rare. The characteristics are a small tubular metal or ivory container which will unscrew into two or three sections. On the other hand, containers for supposedly anti-infection aromatics to neutralize "the ill air" are rather common. Beginning with the extremely rare, 16th century, globular-shaped, multi-compartment pomander ("pomme d'ambre," apple of ambergris) (Fig. 10C), these pass through the sponge-containing vinaigrettes of the early 19th century and reach the Victorian camphor lockets (10K), and aromatic vinegar and smelling-salts bottles (Figs. 10A and B), with single and double compartments, with which may be incorporated a vinaigrette, a patch box, or, as in one of our examples, a magnetic compass.

Vinaigrettes shown in Figure 10H, I, and J, are small, flat, ornamental boxes, practically always silver, containing a bit of sponge charged with aromatic vinegar in a compartment covered by a gilt engraved grid and closed by a tight-fitting outer lid. They can be easily obtained in spite of present-day demand for use as containers for small pills or saccharin tablets. Occasionally examples are encountered with lids inset with semi-precious stones, agate, a cameo, etc. Larger silver containers, usually of continental European origin, for home use of aromatic-containing sponges are also found in the shape of swans, hearts, etc. The following[7] is typical:

Receipt against the plague. Take of rue, sage, mint, rosemary, wormwood, and lavender, a handful of each; infuse them together in a gallon of white wine vinegar, put the whole into a stone-pot closely covered up, upon warm

[7] Glasse, Hannah. *The art of cookery by a lady*. 9th ed. London. 1765. 334 pp.

wood ashes, for four days; after which draw off (or strain through fine flannel) the liquid, and put it into bottles well corked; and into every quart bottle put a quarter of an ounce of camphire. With this preparation wash your mouth, and rub your loins and your temples every day; snuff a little up your nostrils when you go into the air, and carry about you a bit of sponge dipped in the same, in order to smell to upon all occasions, especially when you are near any place or person that is infected. They write, that four malefactors (who had robbed the infested houses, and murdered the people during the course of the plague) owned when they came to the gallows, that they had preserved themselves from the contagion by using the above medicine only; and that they went the whole time from house to house without fear of the distemper.

This passage concerning a smelling bottle is extracted from the advertisement of R. Hayward, Chymist, in a four-page newspaper, *The Morning Chronicle,* London, 15 September 1801:

Also may be had, Mr. Greenbough's celebrated Volatile Salt of Vinegar which is the best Smelling Bottle for reviving the Spirits, and recovering Persons immediately from Fainting or Hysteric Fits; it is a certain preservative from all Putrid Disorders; it relieves the Head-Ach almost instantaneously, and is so great a Purifier of Air, that no Person should go into Playhouses or any crowded rooms without it. Price 2s. 9d. the small, and 5s. the large bottle.

Ancient Egyptian and Roman Specimens

Among the ancient Egyptian and Roman antiques of interest to the apothecary which can be obtained by the private collector are small stone mortars (Fig. 11, lower left), medicine phials, ointment containers, kohl (stibium) pots with applicators, and bronze instruments for mixing and applying various medicinal preparations and cosmetics. Many of the little kohl vases, *ca.* 500 B.C. (Fig. 11) have been found in ancient Egyptian tombs. These pots are in many different forms and materials, stone, glass, ivory, wood, bone and pottery, and are frequently accompanied by small haematite club-shaped applicators. Used from the earliest times, the powdered antimony was moistened and employed to blacken the eyelids and brows, probably by both sexes, for beautification, to shade the eyes from the sun's glare, and to prevent ophthalmia.

Glass was invented by the Egyptians about 3000 B.C. Articles were originally fashioned by moulding about a sand core; only about 100 A.D. was the use of the blowpipe discovered. In Figure 12 are shown (A) a glass kohl pot, Egypt *ca.* 100 A.D., and glass medicine phials: (B) Syria *ca.* 100 A.D., (C) Egypt *ca.* 100 A.D., and (D) Arabia *ca.* 1000 A.D. In excavations in London and elsewhere have been found many small bronze Roman instruments dating from about 100 A.D. used in surgery and in the preparation

and application of medicaments and cosmetics (Fig. 13.) Though most iron instruments of the same period have rusted away, these bronze spoons, probes, and spatulas[8] have been startlingly well preserved. The spatula probe (spathomele: Fig. 13A-C) 7½ inches in length, with an olivary point at one end and a spatula at the other, was primarily a pharmaceutical instrument although it was used also by the surgeon for blunt dissection, as an actual cautery, tongue depressor, etc., and by the artist for mixing colours. The olive end was employed for mixing medicine, the spatula for stirring liquids and for compounding ointments and spreading them on the affected part or on lint. Various articles are also found consisting of a small round or elongated spoon-like end combined with an olivary or plain-ended probe. These were used for mixing, measuring, extracting from tubes and boxes, and applying various ointments, salves, balsams, and powders used by Roman ladies in their toilet and as medicaments. Some were employed as ear spuds. Liquids, such as ear and eye drops, were usually instilled by squeezing a ball of wool which had been dipped in the liquid and placed about the middle of the probe and letting it run off the point.

English Medicine Phials

In Figure 14 are shown English 17th and 18th century medicine bottles. The characteristic feature of early 17th century specimens is a neck which has been crudely everted and trimmed to form a mouth. Examples dating from the third quarter of the century show a less uneven rim, a short neck, and weak sloping shoulders. In the late 17th and early 18th century bottles the rims are more marked, and the shoulders are angular. Previous to 1700 the glass was very thin and of a greenish or bluish green colour, after that it became thick and clear. Specimens are found in old refuse heaps and at the bottoms of wells. Due to the thinness of the glass only a small proportion of those excavated are found intact. However, about the year 1700 at least four glass factories in London alone were manufacturing bottles and due to the number discarded after use perfect specimens still are obtainable rather readily.

Quack Practitioners and Nostrums

From time immemorial the healing professions have been plagued by quack practitioners and medicines. The sale of patent and secret medicines was fostered by newspaper advertising, the

[8] Milne, John Stewart. *Surgical instruments in Greek and Roman times.* Oxford, Clarendon Press, 1907. 187 pp.

distribution of pamphlets, posting bills, and by "quacking" the wares in public places. In two, four-page London newspapers, *The Morning Chronicle* of 15 September 1801 and *The Traveler* of 12 May 1815, one-quarter of the space occupied by advertisements is taken up by medical ones. In *The Chronicle,* of a total of 55 advertisements, 11 are medical. Of these, four are for courses of lectures delivered in hospitals, the Theatre of Anatomy, or in the instructing physician's home, on anatomy, surgery, midwifery, or the theory and practice of physic. Four are for patent or secret remedies—tooth powder, worm lozenges, and "tonics." Three are antivenereal —a book on what every sufferer from venereal disease should know; a quack practitioner, personal or mail consultation—"letters from the country are expected to enclose a one-pound note"; and an antivenereal nostrum complete with a testimonial. The testimonial was given by Wm. Pierson of Manchester to Thos. Taylor, Member of the Royal College of Surgeons London, sole proprietor of Leake's patent pills "for sale by one person in every considerable town in Great Britain and Ireland, sealed up with full and plain directions, whereby persons of either sex may cure themselves with ease, speed, secrecy and safety." Mr. Pierson testified that about two years before he had been attacked by a venereal disease. In spite of consulting the most eminent of the Faculty he was reduced to a mere skeleton, his skin was covered with ulcers, and his friends considered his death imminent. However, a relative induced him to try a box of Leake's patent pills and after three months, "I am now, thank God, perfectly recovered and walking out daily. For the public benefit I do not object to the above being published."

In *The Traveler* are to be found large advertisements of antivenereal medicines, occupying one-half and two-thirds of a column respectively, and one for Dixon's antibilious pills. Whereas in the venereal remedies the names of "several noblemen and gentlemen of the first respectability who have received a radical and permanent cure and request that references may be made to them" are not printed, Mr. Dixon, apothecary, is pleased to announce the great success of his anti-bilious pills in many obstinate bilious disorders particularly in the Duke of Bedford, Sir George Warren, the Dowager Lady Say and Sele, the Viscountess Bulkeley, & C "who have persuaded him to offer the remedy to the public under the approbation and sanction of their names."

Handbills were distributed on the streets. "When a foreigner walks the streets of London, and has, between St. Paul's and Charing-Cross, a score of printed bills put into his hands, which

promise to cure all the disorders incident or not incident to the human frame; he must think we are the most wholesome and well-purged people in the world, or the greatest bubbles that exist in it."[9] "Pedestrian or itinerant doctors" distributed pamphlets to the homes of "credulous women, and the lower orders of the community." The following are extracts from one of the handbills of these empirics, who was travelling through the country in 1805.[9]

G. R. — By his Majesty's authority. To this place is come Dr. Motes, practitioner in physic . . . who by many years experience and practice has daily success in curing the following disorders, by the virtue of herbs, roots, and plants, which are the only safe medicines to preserve and restore health. The aforesaid medicines are recommended to be superior to any other medicine. Hundreds have experienced their happy effects, by a perfect cure when all other methods have failed. The number of extraordinary cures that have been performed by the use of the valuable herbs aforesaid, both internal and external, many of whom had been turned out of the hospitals, and declared incurable by the faculty. Their efficacy is so remarkable, that a small bottle of the medicine is sufficient for a trial of its virtues; in cases of scurvy in the blood, leprosy, venereal complaints, and every other foulness in the blood. Also, cures old sores, though of ever so long standing, cures disorders of the head and eyes, hardness of hearing & C. Also, the dropsy and yellow jaundice, consumption, asthma, & C. destroys worms in young or old in a short space of time. Also the gravel and stones. Likewise the piles and itch cured in a few days without the least smell. All sorts of agues, and any long contracted fevers, cured though ever so inveterate. All disorders in the female sex, especially such as arise by any hurt from lying-in, cured in a surprising manner. Also nervous complaints, and inward weaknesses, lowness and oppression of spirit, swimming in the head, coughs, shortness of breath and many other disorders too tedious to mention. Tincture for the tooth-ach, and scurvy in the gums. This valuable tincture gives immediate ease to the most violent tooth-ach, and beautifies the teeth, if they are as black as coal, it will make them as white as snow in three or four times using. It cures all distempers in the teeth and gums, and prevents the teeth from rotting, and those that are decayed from being worse, fastens those that are loose, and perfectly cures the scurvy in the gums. Also a tincture for the headach. This tincture never fails in curing the most violent head-ach on the first application. Likewise an excellent British corn liquid, has never failed to cure, when the corn has been upwards of twenty years standing. . . . . It cures hard or soft corns in three or four times using, without pain or trouble, as hundreds have experienced to their comfort. Pleased to keep the bill till called for. Waters, Printer, Cranbrook.

Frequently the quack-medicine purveyor set up a platform in the public square and after a crowd had been gathered through the entertainment provided by a fool and his monkey, the practitioner, most of whom "are so naturally ignorant, that they can neither read

[9] Anonymous. *Essay on quackery and the dreadful consequences arising from taking advertised medicines.* Kingston-upon-Hull, T. Clayton, 1805, 140 pp.

or write, and of course are unable to sign their own name," took over. The medicines the quack "through his bounty to the public is willing to let you have for the small value of six-pence" were so pleasant and easy of administration that in venereal diseases " 'Tis worth any person's while to get the Distemper once a fortnight, if it be had for love or money, to enjoy the benefit of so diverting a Remedy."[9]

The dispensing quack did not escape the thrust of the caricaturist and in illustration is shown Rowlandson's "The Quack Doctor" in his shop, the lintel of which is labeled "Apothecaries Hall," (plate 11 from *The English Dance of Death*, London, 1815, 1816).

> Of this grand shop behold the Master,
> Who deals in Bolus, Pill and Plaister.
> See how his visage he disposes,
> As his hands measure out the doses;
> While his round paunch most truly tells,
> He never takes the Drugs he sells.

Meanwhile the obese patient, whose complaint is loss of appetite, observes Death compounding "slow poison" and decides:

> I'll take no Drugs that fellow pounds.
> I'd better far, to save my bacon,
> Go back to those I have forsaken,
> And look once more for healing knowledge,
> To grave Sages of the College.

Even more than is the case with other antiques, specimens of medical interest are becoming scarcer and more costly. A few articles of interest to the apothecary may be obtained locally, but the major source of this material is Great Britain. On account of their decorative value drug jars are advertised for sale occasionally in American and English antique magazines. Coins and medals can be obtained by submitting a want list to one of the several large English, French, or American coin dealers. Other specimens can be procured through enquiries addressed to a series of antique dealers or, much better in the author's experience, by selecting a suitable antique dealer and giving him a firm order, within an agreed-upon price limit, for certain articles, if, as, and when he procures them. One of the best directories of British antique dealers is to be found in *The Antique Year Book* (Tibberton, Glos., England, The Tantivy Press, 566 pp., price 7½ shillings or about $1.10 plus postage), in which, happily, you will not find listed the names of my own pet dealers who are still hunting further antiques of medical interest for our own collection.

Ambroise Paré: Sawbones or Scientist?*

BOYD HOWARD HILL, JR.**

AMBROISE Paré (1510-1590), often called the "father of modern surgery," is generally credited with three major contributions: the use of balm instead of boiling oil in the treatment of gunshot wounds; the ligaturing of blood vessels after amputation instead of using cautery; and the obstetrical practice now known as podalic version. None of these can be considered original with Paré.[1] He merely made variations on treatments already in use and raised them out of obscurity. Paré's originality is to be found not so much in individual discoveries as in his attitude toward surgery and in his method. For although Paré was not a thoroughgoing scientist, he often demonstrated a scientific attitude towards his craft. At times, he challenged traditional remedies, and here and there in searching for better ones, he attempted what may be recognized as controlled experiments.

We must not claim too much for Paré nor overlook the many pages of his work that are but repetition of the medical lore handed down to him. Much of what we would like to label as scientific experiment does not go beyond observation. However, in setting down his observations Paré often surpasses his colleagues. Instead of fitting his evidence to the statements of surgical authorities, he often rejects the authority if his own experience is contradictory. Or again he may agree with an authority on one point and disagree with him on another. This willingness to deal critically with even the most revered authors, such as Galen and Hippocrates, represents the trait of a scientific observer.

Paré's readiness to question authorized treatments sprang partially from his training. As a barber-surgeon in 16th century France, his approach was necessarily pragmatic. His education included neither the study of Latin and Greek medical classics nor formal training in logic. These two areas were the province of the

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1 Singer, Dorothea Waley, *Selections from the works of Ambroise Paré*, New York, William Wood & Co., 1924, p. 2.

Faculty of Medicine and the Fraternity of St. Cosmas. But although Paré was denied a scholar's education, he could not ignore the wisdom of the ancients. Throughout his works he buttresses his arguments with ancient and medieval authorities, a common device of 16th century writers. He also uses logic or theoretical knowledge ("raison"). However, he is at his most convincing in relating first-hand observations.

Paré made the first of his three major contributions to surgery in 1537 at the battle of Turin. As a newcomer to military surgery he had never treated fresh gunshot wounds and, therefore, relied upon the Italian surgical treatise of Jean de Vigo (1460-1525). Vigo said that gunshot wounds were poisonous and should be cauterized with boiling oil.[2] Paré was suspicious of this treatment. "In order not to make a mistake, before using the said hot oil, knowing that such a thing would bring extreme pain to the sick, I wanted to know before applying it what other surgeons did at the first dressing, which was to apply the said oil, boiling as hot as could be to the wounds."[3] Paré's humanitarian instinct had warned him to be on guard against harsh remedies. Before risking the book treatment, he watched the surgeons at work around him, but finding that they corroborated Vigo, he was satisfied to proceed.

However, circumstances shaped the events into a kind of experiment, for the oil ran out and Paré was forced to use another substance, this time a balm of egg-yolk, turpentine, and oil of roses. His conscience kept him awake that night worrying about the effects of the unauthorized treatment. Up early to see the results, Paré discovered to his surprise that those treated with the balm were uniformly better than those treated with the caustic. The first group had rested well and their wounds appeared to be healing without undue swelling or inflammation, while the second group was suffering. Satisfied that his method was better than Vigo's, Paré decided "never again to burn so cruelly those poor men wounded by harquebus."[4] His criterion was entirely pragmatic: the new method was more efficient and less painful than the old. It was usually the comfort and welfare of the patient that led Paré to

2 Malgaigne, Joseph-François, *Oeuvres complètes d'Ambroise Paré*, 3 volumes, Paris, J. B. Baillière, 1840, hereinafter cited as *Oeuvres*. "Discovrs Premier svr le Fait des Harqvebvsades, et Avtres Bastons a Fev" (1575), Vol. II, 127: "I'estois en ce temps-là bien doux de sel, parce que ie n'auois encores veu traiter les playes faites par harquebuses . . ."

3 *Ibid.*: "Et pour ne faillir, parauant qu'user de ladite huile feruente, sçachant que telle chose pourroit apporter au malade extreme douleur, ie voulus sçauoir, premierement que d'en appliquer, comme les autres Chirurgiens faisoient pour le premier appareil, qui estoit d'appliquer ladite huile la plus boüillante qu'il leur estoit possible dedans les playes."

4 *Ibid.*: "Adonc ie me deliberay de ne iamais plus brusler ainsi cruellement les pauures blessés de harquebusades."

look for new cures. And here, as elsewhere, he did not go beyond the specific cure to attempt general scientific inquiry.

Paré made his second major contribution to surgery in Paris between 1552 and 1564.[5] Dissatisfied with the method of using cautery on blood vessels after amputation, he began to search for a better way to stanch bleeding. He explains that cautery produced a large scab which dropped off and caused new bleeding from the amputated member. This recurrent process irritated the area so badly that the patient bore an ulcer the rest of his life and could not wear an artificial limb.[6]

It occurred to Paré that ligaturing, which was recommended by Galen for stanching bleeding in wounds, might well be used in cases of amputation. Conferring with Étienne de la Rivière, Surgeon-in-Ordinary to the King, and other surgeons of Paris, Paré received their approval. They "agreed to put it to the test on the first patient who presented himself, while having the cautery irons nearby in case the ligature should fail. Which I tried several times with very good results."[7]

This second contribution then, like the first, was made through experimentation. After Paré had established through testing the ligature that it surpassed cautery in every way, he urged young surgeons to abandon the cruel method of cautery. "No longer be content to say 'I read it in the book of by-gone practitioners, I have seen it done by my old father and masters, following whose practice I cannot fail.' "[8] Paré urges them to go back to Galen and not stop short with their father and masters. Such an appeal to authority seems an ironical conclusion, but it does not alter the experimental nature of Paré's discovery. Paré appeals to Galen only because Galen happened to corroborate his own ideas. Elsewhere he condemns the ancients for their unnecessarily painful methods. One example will suffice to illustrate this point: in the "Apology and Treatise Containing the Voyages Made in Different Places" (1585), he takes issue with the most venerable of medical authorities, Hippocrates, in the treatment of dislocated vertebrae. According to Paré, Hippocrates' method was, in brief, to tie the patient to a ladder and drop him from a rooftop. Paré's remark is: "I do not show

5 *Ibid.*, 224, n. 1.

6 *Ibid.*, "Le Dixiéme Livre Traitant des Contvsions, Combvstions et Gangrenes," 227-229.

7 *Ibid.*, 230: ". . . furent d'aduis que nous en fissions l'espreuue au premier malade qui s'offriroit, combien que nous eussions les cauteres tous prests pour en vser au defaut de la ligature. Ce que i'ay pratiqué à l'endroit de plusieurs auec tres-bonne issue. . . ."

8 *Ibid.*: " 'Ie l'ay leu au liure des anciens Praticiens, Ie l'ay veu faire à mes vieux peres et maistres, suiuant la pratique desquels ie ne puis aucunement faillir.' "

such a way of giving the strapado to men, but I show the surgeon in my works the way to reduce [dislocations] by a sure method and without great pain."[9]

Unlike the first two, Paré's third major contribution is not presented in experimental form. In fact, Paré does not claim that podalic version is a new method at all. He states simply that in case of a feet-first presentation in the womb, the infant should be turned into normal position before delivery.[10]

The case for Paré as an experimentalist is by no means exhausted with his three major contributions. Several other excellent examples can be cited. One of them occurred at the siege of Turin in 1537. When a kitchen boy of the Marshall of Montejan was burned by a cauldron of nearly boiling oil, Paré was called to treat him. Seeking remedies at the apothecary's shop, he was urged by an old village woman to try raw onions beaten with a little salt. Paré inquired if she had ever experimented with the method.[11] She had, indeed; so Paré was anxious to try it out himself. Sure enough, the boy developed blisters only where the onions had not been applied.

Paré adds that some time later one of Montejan's guards, having drunk heavily, was severely burned on hands and face when his gunpowder flask took fire. This time Paré attempted to control the treatment so that the results could not be misinterpreted, covering only half of the patient's face with onions and using the traditional remedies on the other half. The onion treatment was confirmed, for the side where they were applied showed no signs of excoriation whereas the other side was covered with blisters.[12]

Paré mentions this onion treatment once again, in his "Treatise on Contusions, Combustions, and Gangrenes." When in Piedmont, he used it on several soldiers burned by cannon powder, and they developed no blisters or pustules afterwards. The event forms part of a discussion of medicines whose qualities are "heat" and "attraction." According to the theory of the four humors, such substances would not be recommended for burns. In general, cooling substances were applied. "I know," says Paré, "that those who have not

9 *Ibid.*, III, "Apologie et Traité Contenant les Voyages Faits en Divers Lievx," 686: "Or ie ne monstre pas vne telle maniere de donner l'estrapade aux hommes: mais ie monstre au Chirurgien en mes Œuures, la maniere de les reduire seurement et sans grande douleur."

Professor Loren C. MacKinney points out that Hippocrates did not make use of this violent method, although he did praise its inventor. See: Emile Littré, *Oeuvres complètes d'Hippocrate*, 10 volumes, Paris, J. B. Baillière, 1839-1861, Vol. IV, 58 and 183-185.

10 *Ibid.*, II, "La Maniere de Extraire les Enfans Tant Mors Qve Vivans Hors le Ventre de la Mere, Lors Qve Natvre de Soy ne Pevlt Venir a son Effect," 628.

11 *Ibid.*, p. 128: "Ie demanday à ladite vieille si autresfois l'auoit experimenté. . . ."

12 *Ibid.*, pp. 128-129.

yet experimented with this treatment, considering the hot quality of onions, would condemn their use, arguing that maladies are cured by their contraries, and that combustion is caused by heat; thus, the cure demands cold remedies. However, if they will listen to reason, they will understand."[13]

Paré, in disagreement with Galen in this matter, attempts to prove that his new discovery is valid. "Onions, says Galen, are hot in the fourth degree: which far from opposing combustion, would instead be a cause of augmenting it: the reason they cannot well be applied. But although such reasoning has the look of probability, nevertheless, experience, logic, and authority show us the contrary, which I have several times witnessed."[14] Paré demonstrates by logic that onions are "potentially" hot and "actually" humid. Their heat rarifies the skin and their humidity relaxes it. This process draws out, consumes, drains, and dries the flowing humour, thus preventing blisters. Thus, Paré is able to harmonize his discordant observation with medical doctrine.

These episodes about the onion treatment show Paré an observer first and a theoretician second. Henry E. Sigerist in his article, "Ambroise Paré's Onion Treatment of Burns,"[15] thought it "illustrated beautifully his entire mode of thinking and acting," which he characterized as a "frank, unbiased, experimental approach."[16]

In his treatise on poisons, Paré is adamant in his reliance on experiment as the true test of medicine, arguing against the claim that the bezoar stone was a universal antidote. Paré does not tell precisely what convinced him that it was a worthless remedy, but it is clear that he was drawing on his experience and not on tradition. The experiment of the bezoar stone is prefaced by an account of its history and supposed virtues as given by a Spaniard, Garcia de Horto. Garcia used it not only against poisons but also against leprosy and impetigo. "That is what Garcia du Jardin writes on the origin and effects of the Bezoar stone, not through having read

13 *Ibid.*, p. 204: "Ie sçay que plusieurs n'ayans encores experimenté ce remede des oignons, consideré leur qualité chaude, contemneront l'application d'iceux, voulans disputer les maladies estre curées par leurs contraires, et que combustion est faite par chaleur: parquoy pour sa cure demande remedes froids. Toutesfois s'ils veulent ouïr la raison, ils comprendront."

14 *Ibid.*: "Les oignons, comme dit Galien, sont chauds au quatriéme degré: dont tant s'en faut qu'ils contrarient aux combustions, que plustost doiuent estre cause de l'augmenter: parquoy n'y peuuent commodément estre appliqués. Or nonobstant que telle raison ait quelque apparence de probabilité, toutesfois l'experience, raison, et autorité nous en demonstrent le contraire: ce que i'ay veu plusieurs fois par experience."

15 *Bull. Hist. Med.*, 1944, *15*, 143-149.

16 *Ibid.*, p. 148.

or heard about it but (as he assures us) through having seen and experimented with it."[17]

Paré recounts his own experiment with the bezoar stone to discredit the fraudulent claim. "The late king [Charles IX] being at his town of Clermont in Auvergne, was given a bezoar stone from Spain by a lord who said it was good against all poisons and esteemed it greatly. So, being in the chamber of the said king, he called me and asked whether there could be found a sure and simple drug that would be good against all poisons; whereupon right away I answered him saying no, since there were several sorts and kinds of poisons."[18] Paré lists the properties of poisons and argues that their antidotes must necessarily differ one from the other. Yet in spite of his conviction that a single substance could not be a universal antidote, the lord insisted that the bezoar stone was efficacious against all poisons.

Paré then performed an experiment for which his modern editors have usually apologized. He asked the king to fetch a condemned prisoner on whom the stone could be tested. Such a man was readily found and the proposition put to him. If he wished to gamble, he could take poison and then be treated with an antidote that might save him, in which case he would go free. If it did not work, he would lose no more than a hanging. To this bargain the prisoner readily agreed, saying that he had rather die in private than be hanged in public. Paré's opinion of the bezoar stone was of course vindicated, for the test subject died a violent death. Paré's terse comment on the experiment is as follows: "And so the Spanish stone, as the experiment shows, had no virtue at all. For this reason the King ordered it flung into the fire: which was done."[19]

In the case of two other fabulous remedies, "mummy" and "unicorn's horn," Paré again takes issue with popular belief. In the dedication to the treatises on these substances, he states that neither one has any healing power.[20] However, he adds that he would will-

17 *Oeuvres*, III, "Le Vingt-Troisiéme Livre, Traitant des Venins et Morsvre des Chiens Enragés, et Avtres Morsvres et Piqvevres de Bestes Venenevses," 340: "Voilà ce que Garcia du Iardin escrit de la generation et effets de la pierre Bezahar, non pas pour l'auoir leu ou ouy dire, mais (comme il asseure) pour l'auoir veu et experimenté."

18 *Ibid.*, p. 341: "Le Roy dernierement decedé estant en sa ville de Clermont en Auuergne, vn seigneur luy apporta d'Espagne vne pierre de Bezahar, qu'il luy affermoit estre bonne contre tous venins, et l'estimoit grandement. Or estant alors en la chambre dudit seigneur Roy, il m'appella, et me demanda s'il se pouuoit trouuer quelque certaine et simple drogue, qui fust bonne contre toute poison: où tout subit luy respons, que non, disant qu'il y auoit plusieurs sortes et manieres de venins."

19 *Ibid.*, p. 342: "Et ainsi la pierre d'Espagne, comme l'experience le monstra, n'eut aucune vertu. A ceste cause le Roy commanda qu'on la iettast au feu: ce qui fut fait."

20 *Ibid.*, "Discovrs de la Mvmie et de la Licorne, A Tres-Havt et Pvissant Seignevr, Messire Christophle des Vrsains," pp. 468-473.

ingly be proven wrong by reason or experience, and that, far from being offended, he would be delighted to find out what he had been unable to learn from the eminent persons who believed in these remedies. In the margin is one of Paré's characteristic comments, "modestie de l'autheur."[21]

In both the "Discourse on Mummy" and the "Discourse on Unicorn's Horn," Paré relies on experience for his conclusions. Convinced that unicorns had only doubtful existence[22] and that the horns supposedly obtained from them were useless, he asked a doctor acquaintance whey he prescribed them. The physician replied that the sick have faith in it; if it should be denied them and they then died, their relatives would give chase to the doctors. "Moreover, he said that any man who undertakes to describe things of importance, and notably to refute a long held opinion, resembles the owl that reveals itself in a prominent place exposing himself to all the other birds, which come to peck at him."[23] Paré repeats this metaphor at the end of the dedication as a kind of apology or warning for his boldness. "For when this little book sees the light, I will resemble the owl and I think there will be some gay or naughty crow, enemy of truth and of the public good, who will harass and peck at me."[24]

In the "Discourse on Mummy," Paré takes a common sense approach rather than a strictly experimental one. He does not give us any specific tests of "mummy," but his investigative spirit is nonetheless evident. First, he determined that so-called "mummy" was usually not imported from Egypt but was manufactured in France:

> . . . he who wants to explore as I did at the Apothecaries' shops will find members and portions of dead bodies, sometimes whole ones, being embalmed in pitch, which give off a cadaverous odor. Nevertheless, I believe they are as good as those brought from Egypt, because none of them are worth a thing.[25]

21 *Ibid.*, p. 473.

22 *Ibid.*, p. 495: "Et quant à moy, ie croy que la Licorne n'a encores esté descouuerte, ou pour le moins bien rarement, et que ce n'est qu'vne imposture de vendre tant de cornes de Licorne que l'on fait accroire."

23 *Ibid.*, p. 472: "D'auantage disoit que tout homme qui entreprend à descrire de choses d'importance, et notamment de refuter quelque opinion receuë de long temps, il ressemble au hibou ou chat huant, lequel se monstrant en quelque lieu eminent, se met en butte à tous les autres oiseaux, qui le viennent becqueter."

24 *Ibid.*, p. 473: ". . . car lors que ce petit liure sera en lumiere, ie ressembleray au Hibou, et croy qu'il y aura quelque Gay ou meschant Corbeau, ennemy de la verité et de la Republique, qu. me caiolleront et becquetteront."

25 *Ibid.*, p. 481: "Mais qui voudra rechercher, comme i'ay fait, chez les Apoticaires, on trouuera des membres et portions de corps morts, voire de tous entiers, estre embaumés de poix noire, lesquels sentent vne odeur cadauereuse. Neantmoins ie croy qu'ils sont aussi bons que ceux qu'on apporte d'Egypte: parceque tout n'en vaut rien."

Mummy was especially used to stop internal bleeding, and Paré's own experience with it led him to condemn its use:

> If there were something efficacious in this remedy then truly there would have been some pretext for excuse. But the action of this wicked drug is such that not only does it profit nothing to the sick, as I have many times seen by experience with those to whom it has been given, but it causes a bad stomach ache, with stinking at the mouth, and great vomiting, which is rather a cause of stirring up the blood and of making it leave its vessels than of stopping it. . . . For this reason I protest that I will never prescribe it nor permit anyone to take it if it is in my power.[26]

The "Discourse on Unicorn's Horn," which forms a companion piece to the "Discourse on Mummy," is perhaps the best of Paré's experimental treatises. The first 14 chapters discuss various theories about the unicorn and other horned beasts such as the rhinoceros and the "Florida bull." They are not all important for our discussion, but the last four chapters deserve attention. Paré sets out to prove by experience, authority, and logic that there is no healing power in the unicorn's horn, putting before the reader not one but a series of experiments to prove his case. Bringing up one theory after another, Paré disproves each one by testing it himself, even going so far as to discredit the royal unicorn's horn. "And to begin with experience, I can assure you that after having tested it several times, I never knew the supposed unicorn's horn to have any effect whatsoever."[27]

Paré begins with the claim that if one dips unicorn's horn in water and then draws a circle with it, a scorpion, spider, or toad placed inside will die when it crosses the boundary. "I experimented with it and found that it was false and illusory: for the said creatures passed and repassed over the perimeter of the circle and did not die at all."[28] Paré elaborated on this experiment to confirm his first test. "Likewise, not being content with putting the toad inside the circle of water in which unicorn's horn had been dipped, over which he passed again and again, I put him in a vessel full of water in which unicorn's horn had been dipped, and I left him in

[26] *Ibid.*, "Discovrs de la Mvmie," pp. 482-483: "Et si en ce remede y auoit quelque efficace, veritablement il y auroit quelque pretexte d'excuse. Mais le fait est tel de ceste meschante drogue, que non seulement elle ne profite de rien aux malades, comme i'ay plusieurs fois veu par experience à ceux ausquels on en auoit fait prendre, ains leur cause grande douleur à l'estomach, auec puanteur de bouche, grand vomissement, qui est plustost cause d'esmouuoir le sang, et le faire d'auantage sortir hors de ses vaisseaux, que de l'arrester. . . . A ceste cause ie proteste de iamais n'en ordonner, ny permettre à aucun en prendre, s'il m'est possible."

[27] *Ibid.*, "Discovrs de la Licorne," p. 505: "Et pour commencer à l'experience, ie puis asseurer, aprés l'auoir esprouué plusieurs fois, n'auoir iamais conneu aucun effet en la corne pretendue de licorne."

[28] *Ibid.*: "Ie l'ay experimenté, et trouuay cela estre faux et mensonger: car lesdits animaux passoient et repassoient hors du circuit du cercle, et ne mouroient point."

the water for the space of three days, at the end of which the toad was as lively as when I put him in."[29]

Paré anticipates his critics by adding that if anyone says he did not use real unicorn's horn, then the royal unicorn's horn at Saint Denis and those of the merchants of Paris, which sell at higher prices than gold, are not real either, for those were the very ones he put to the test. He challenges anyone who doubts him to try testing unicorn's horn himself if he would find out the truth.

The second theory that Paré disproves is that true unicorn's horn when dipped in water begins to boil, forming pearl-like bubbles that rise up in the vessel. "That happens equally with horns of steer, goat, sheep or other animals, with elephant tusks, pot lids, tiles, wood, Armenian bole, and sigillate earth, and, in a word, with all other porous bodies. For the air that is enclosed in them escapes through the pores, giving place to the water, which causes the boiling and little bubbles that are seen rising in the water."[30] Paré also disproves the idea that a pigeon or chicken that has been given sublimate of arsenic or other poison can be revived by unicorn's horn. "This is equally false, as experience will testify."[31]

Finally, Paré denies that unicorn's horn gives off an odor of musk when placed near the fire. Neither does it turn the water in which it is placed to a milky color. "Such things are never seen, as experience demonstrates."[32]

Next, Paré attempts to reinforce his experiments by appeal to authority. Galen and Hippocrates both recommended deer antlers and elephant tusks, yet never mentioned unicorn's horn. This argument seems unnecessary after the foregoing experiments, but it demonstrates the importance of the ancients to the 16th century writers: they had to be acknowledged even if they could contribute little to the discussion. More significant is Paré's conversation with Monsieur Chappelain, physician to King Charles IX:

> One day speaking with him about the great abuse that is committed in using the unicorn's horn, I prayed him (seeing the authority he had with the king for his great knowledge and experience) to do away with

[29] *Ibid.*: "Mesmement, ne me contentant pas d'auoir mis vn crapaut dedans le circuit de l'eau où la licorne auoit trempé, par dessus lequel il passoit et repassoit: ie le mis tremper en vn vaisseau plein d'eau, où la corne de licorne auoit trempé, et le laissay en ladite eau par l'espace de trois iours, au bout desquels le crapaut estoit aussi gaillard que lors que ie l'y mis."

[30] *Ibid.*: "Ie dis que cela se fait aussi bien auec cornes de boeuf, de chéures, de mouton, ou autres animaux: auec dents d'elephant, tests de pots, tuilles, bois, bol armene, et terre sigillée: et pour le dire en vn mot, auec tous autres corps poreux. Car l'air qui est enclos en iceux sort par les porosités, pour donner place à l'eau, qui cause le boüillonnement et les petites bubes qu'on voit esleuer en l'eau."

[31] *Ibid.*: Cela est pareillement faux, comme l'experience en fera foy."

[32] *Ibid.*, p. 506: "Telles choses ne se voyent point, comme l'experience le monstre."

this practice and especially to abolish this custom of dipping a piece of unicorn's horn in the king's drinking cup for fear of poison. He answered me that as for himself he knew indeed that there was no virtue in unicorn's horn; but he saw that its reputation had become inveterate and rooted in the minds of princes and of the people; and that while he would willingly have it done away with, he believed that he could not accomplish it through force of reason.[33]

The physician finished weakly that while the unicorn superstition did no good whatsoever, it did no harm either except to the pocketbook. Paré did not agree that an ineffectual drug could be harmless to the public. "You will ask me that if the doctors know and state publicly that this powder of unicorn's horn is nothing but an abuse, why do they prescribe it? It is because people want to be fooled and have often forced the doctors to prescribe it, or more accurately, to permit their patients to use it because they want it."[34]

This treatise was attacked by an anonymous person who was outraged at Paré's dismissal of the ancients. Paré's reply in 1582 answers these accusations with as great insight as can be found anywhere in his works. The attack stated first that the sages agree on the wonderful efficacy of the unicorn's horn, and therefore all must acquiesce in their authority, " 'as it is better to fail with the sages than to deliberate well in contradiction to their opinion.' "[35] In answering this *prononcement* Paré is not only more eloquent but also more philosophical than elsewhere. He generalizes on his experience and comes to the conclusion that he "would rather do well all alone than to fail not only with the sages but with all the rest of the world. For the excellence of truth is so great that it surpasses all human wisdom, which is most often armed only with bravado, puffed up with wind, and adorned with show and vanity:

[33] *Ibid.*, p. 508: "Vn iour luy parlant du grand abus qui se commettoit en vsant de la corne de Licorne, le priay (veu l'authorité qu'il auoit à l'endroit de la personne du Roy nostre maistre, pour son grand sçauoir et experience) d'en vouloir oster l'vsage, et principalement d'abolir ceste coustume qu'on auoit de laisser tremper vn morceau de licorne dedans la coupe où le Roy beuuoit, craignant la poison. Il me fit response, que quant à luy, veritablement il ne connoissoit aucune vertu en la corne de licorne: mais qu'il voyoit l'opinion qu'on auoit d'icelle estre tant inueterée et enracinée au cerueau des princes et du peuple, qu'ores qu'il l'eust volontiers ostée, il croyoit bien que par raison n'en pourroit estre maistre."

[34] *Ibid.*, p. 509: "Vous me direz: puis que les Medecins sçauent bien, et publient eux-mesmes, que ce n'est qu'vn abus de ceste poudre de licorne, pourquoy en ordonnent-ils? C'est que le monde veut estre trompé, et sont contraints lesdits Medecins bien souuent d'en ordonner, ou pour mieux dire, permettre aux patiens d'en vser, parce qu'ils en veulent."

[35] *Ibid.*, "Repliqve d'Ambroise Paré, Premier Chirvrgien dv Roy, a la Response Faite contre son Discovrs de la Licorne," p. 515: " 'il faut bien que la licorne ave de grandes vertus, veu que tous les sages demeurent entr'eux d'accord des admirables proprietés d'icelle. Et que partant il faut acquiescer à leur authorité: attendu qu'il vaut mieux faillir auec les sages, que bien opiner contre leur opinion.' "

for the truth alone must be sought, followed, and cherished."[36] He continues that the length of time that unicorn's horn has been in use is no guarantee of its effectiveness, for such fads are based only on opinion; and the truth depends not on opinion but on fact. Moreover, he denies that one is automatically an authority in the realm of science merely because one is an authority in some other sphere. "Therefore it avails nothing to cite the Popes, Emperors, Kings and Potentates who have put unicorn's horn in their treasuries; for they are not of themselves competent judges of the properties of natural things: and those who are supposedly eye-witnesses [of its power] were either cross-eyed or blinking, to have reported black for white."[37]

Less eloquent though equally shrewd is Paré's reasoning on the question of whether the unicorn's horn contains air, which was a necessary ingredient of antidotes. His attacker stated that elementary things are composed of all four elements and that therefore the unicorn's horn must be a mixture of all four, including air. Paré does not accept this theory. He skirts it by pleading a special rationale for medicine, in effect saying that physicians need recognize only those things that are tangible and that have calculable effects:

> In answer I say that things in medicine are measured and considered only by the senses and by the effects. Although by discourse of reason we understand that pepper, ginger, and paradise seed are composed of four elements (namely) hot, cold, dry, and moist; yet doctors recognize in them only hot and dry because they principally cause in us the effects of heat and dryness alone. So we deny that the unicorn's horn is aerated, for it does not produce the effects of aerated bodies, namely, vapor, smoke, and odor. Whoever finds air in unicorn's horn will draw oil out of a wall.[38]

Instead of reconciling his observations to current belief as in the onion experiment, Paré has established a different frame of refer-

[36] *Ibid.*, pp. 515-516: "i'aimerois mieux faire bien tout seul, que de faillir non seulement auec les sages, mais mesme auec tout le reste du monde. Car l'excellence de la verité est si grande, qu'elle surpasse toute la sapience humaine, qui bien souuent n'est armée que de brauade, n'est enflée que de vent, n'est parée que d'apparence et vanité: parquoy la seule verité doit estre cherchée, suiuie et cherie."

[37] *Ibid.*, p. 516: "Parquoy rien ne sert de m'alleguer les Papes, Empereurs, Roys et Potentats, qui ont mis la corne de Licorne en leurs thresors: car ils ne sont d'eux-mesmes iuges competans de la proprieté des choses naturelles: et ceux par les yeux desquels ils ont veu, ont esté ou louches ou conniuens, de leur auoir monstré ou laissé voir le noir pour le blanc."

[38] *Ibid.*, pp. 517-518: "Pour replique ie dis, que les choses en Medecine ne se mesurent et considerent que par les sens et effects. Bien donc que par discours de raison nous comprenions que le poyure, gingembre, et graine de paradis sont composés des quatre elemens (c'est à dire) de chaud, froid, sec, et humide: toutesfois les Medecins n'y reconnoissent que du chaud et du sec, pource qu'ils ne font en nous principalement que les effects de chaleur et de seicheresse: ainsi nous nions la corne de Licorne estre aërée, parce qu'elle ne produit les effects des corps aërés, c'est à dire de vapeur, fumée, et odeur. Quiconque trouuera de l'air en la corne de Licorne, il tirera de l'huile d'vn mur."

ence for the physician. He has claimed for medicine the need of being empirical; in fact, he has limited it to empiricism, and in this claim he approaches the experimental scientist.

Finally, Paré refutes his attacker's statement that because the king refused 100,000 écus for his unicorn's horn it must be an efficacious remedy. Paré answers that the king, out of his magnificence, might have refused this amount for the unicorn's horn, but the fact that he leaves it in the charge of a simple cleric at St. Denis, who lets it be seen indiscriminately, shows he does not value it greatly. Paré's reasoning on the high price of unicorn's horn parallels his remark earlier that the length of time it has been in use does not prove its efficacy. This argument shows Paré examining the false logic of his opponent.

* * *

The foregoing examples represent Paré as an experimentalist, but such a one-sided picture is inaccurate. As stated in the introduction, a large part of his writings are mere compilation of 16th century lore, and many times when he approaches experiment, he never really leaves the realm of observation. To give a rounded portrait of Paré, one would have to go even further. It must be admitted that there are passages in his works in which he accepts the most fantastic kind of superstition. One such passage is found in the "Treatise on Monsters" and shows how readily Paré could accept hearsay: "Those who are possessed by demons speak with the tongue hanging out of the mouth, through the stomach, and through the natural parts, in unknown languages. They make the earth tremble, cause thunder, lightning, and wind: uproot and tear out trees, no matter how big and strong: they can cause a mountain to move from one place to another; they can raise a chateau in air and put it back in its place."[39]

Paré believed in sorcerers as well as demons. One of their tricks, he says, is to prevent a couple from consummating their marriage, popularly known as "noüer l'aiguillette." "There is no punishment too cruel for such sorcerers, because their wickedness and all their plans are aimed against the majesty of God to spite him and offend the human race in a thousand ways."[40] It might be

[39] *Ibid.*, "Le Dix-Nevfiéme Livre Traitant des Monstres et Prodiges," p. 55: "Ceux qui sont possedés des demons, parlent la langue tirée hors la bouche, par le ventre, par les parties naturelles, et parlent diuers langages inconneus. Ils font trembler la terre, tonner, esclairer, venter: desracinent et arrachent les arbres, tant gros et forts soient-ils: ils font marcher vne montagne d'vn lieu en autre, sousleuent en l'air vn chasteau, et le remettent en sa place."

[40] *Ibid.*, p. 67: "Parquoy il n'y a peine si cruelle qui peust suffire à punir les sorciers: d'autant que toute leur meschanceté et tous leurs desseins se dressent contre la maiesté de Dieu, pour le despiter, et offenser le genre humain par mille moyens."

argued that Paré's religious faith permitted him to believe in sorcerers, but such beliefs are nonetheless superstitious. If he did not believe in the existence of unicorns, why should he believe in demons and sorcerers?

One more statement on sorcerers will serve to show Paré at his most unscientific. "No one can deny or doubt that there are sorcerers since it is proved by several doctors and expositors old as well as new. . . . Furthermore, experience and reason force us to admit [their existence] because laws have established punishments for such people."[41] This is disappointing in two respects: in the first statement, because Paré leans on authority to the exclusion of experience; and in the second, because he uses the kind of faulty logic that he elsewhere condemns. When he says that laws against sorcerers are proof of their existence, he parallels the statement that unicorn's horn must be efficacious because it is worth much money and has been used a long time.

Paré's acceptance of popular lore is not confined to works outside surgery, like the "Treatise on Monsters." Even in his own field he frequently falls back on traditional doctrine. In the actual recounting of an experiment, Paré is scientific enough, but in defending his conclusions he sometimes abandons empiricism. Such is the case in the "Apology for the Treatise on Gunshot Wounds." Le Paulmier of Caen had attacked Paré's new treatment for gunshot wounds and had accused him of causing the heavy losses at the siege of Rouen. It will be remembered that Paré arrived at his new treatment for gunshot wounds through experimental technique. But in his reply to Le Paulmier he defends this treatment by blaming the high mortality rate at Rouen on the corrupting influence of the air. To reinforce this false assumption, he adds another equally false one: if the stars can send plague, then their qualities in the air can infect wounds.[42] Pare has wandered far from the sound methods used in his experiment.

Why should Paré accept the influence of evil spirits and sorcerers without any direct proof of their existence when he rejected unicorn's horn, mummy, and bezoar stone as quack remedies? Perhaps because evil spirits and sorcerers did not lend themselves to experiment as readily as the three magic substances. Perhaps, too, because evil spirits and sorcerers were merely explana-

41 *Ibid.*, p. 53: "Or nul ne peut nier, et n'en faut douter, qu'il n'y ait des sorciers: car cela se preuue par authorité de plusieurs Docteurs et expositeurs tant vieux que modernes. . . . D'auantage l'experience et la raison nous contraignent le confesser, par-ce que les loix ont establi des peines contre telles manieres de gens."

42 *Ibid.*, II, 177.

tions for maladies. Bezoar stone, unicorn's horn, and mummy were being used as remedies and, therefore, impinged on Paré's activities as a practising surgeon. Where superstition was substituted for a sound cure, Paré was quick to dispute it and put it to the test. But where superstition merely offered explanation for mysterious conditions like the origin of plague, the failure of a couple to consummate their marriage, and the death of patients who received good treatment, he had no reason to doubt current belief. Apparently, the springboard of Paré's actions was his humanitarianism. He pursued most diligently those medical problems which gave undue pain, and he exposed those superstitions which were useless or harmful as remedies. But he did not challenge the whole fabric of false ideas of the 16th century.

Paré was not a general scientific investigator but a practising surgeon with definite goals and definite reasons for questioning treatments that were ineffectual or inhumane. Throughout his career his interest remained with the patient. When a specific cure was effected, he was satisfied and did not proceed to follow up the implications. Yet despite the limited scope of his inquiry and the crudeness of his technique, Paré can be considered a prototype of later experimental scientists.

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The "Great Mother" and Some Early Medical Illustrations

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THE six full-page illustrations in Ketham's *Fasciculus medicinae*, printed at Venice in 1491 by the brothers de Gregoriis, constitute the first effective use of printed diagrams in a medical text. This publication thus marks an epoch in the history of medicine. Nevertheless, Sudhoff in his introduction to the facsimile reproduction of the *Fasciculus* (1924) demonstrates that both illustrations and text can be traced back in manuscripts for at least a century, so that the *Fasciculus* is a mediaeval work in Renaissance guise.

Sudhoff devotes considerable attention to the antecedents of one of the *Fasciculus* illustrations, a highly conventional diagram of the visceral anatomy in a pregnant woman, depicted in a curious frog-like squatting posture (Fig. 1). He shows that similar figures are encountered in European manuscripts going back to the end of the 14th century; he has been unable to find earlier examples than this. In Persian manuscripts a comparable pregnancy figure (Fig. 2) is found attached to a series of conventional anatomical diagrams which Sudhoff has named the "five-picture series." According to Elgood (1951) these diagrams became current in Persia also from the end of the 14th century. Frank[1] states that Sudhoff has traced the five-picture series in Europe back to the 12th century. A pregnancy figure accompanies a late 13th century Provençal five-figure series but breaks away from the stereotyped squatting pose of the other figures. Although mediaeval western medicine was so deeply under oriental influence, Sudhoff considers that the western pregnancy figures were not directly of eastern origin, but that both are almost certainly derived, together with the five-picture series of diagrams, from a classical Alexandrian source.

Commenting on the frog-like posture of the *Fasciculus* illustration, Sudhoff says:

> Attempts can be made to explain the pose of the figure as the position of delivery or even as the attitude on the birth stool. The figure, however, does not exhibit the state of full pregnancy but the anatomy in about the fifth month. It could also be suggested that the position of the hands in

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> the attitude of prayer may be compared to that of the "Eileithyia" representations of antiquity. The comparison must probably break down since the position of the hands in the pregnant woman . . . seems to be taken from that of the associated male figures.

Sudhoff's concluding remark has little force, since most of the male figures in either the printed or the manuscript *Fasciculus* do not in fact have upraised arms. Possibly, although Sudhoff does not say so, he was influenced by the fact that in Persian pregnancy figures and in the five-picture series the hands are usually lowered in front of the thighs (Fig. 2).

I wish to suggest that the squatting pose of these figures, irrespective of the position of the arms, affords a stronger argument than Sudhoff recognised for deriving them from ancient representations of a goddess of fecundity.

Sudhoff's opinion that the figures originated in Alexandria has already been cited. Margaret Murray (1934) describes terra-cotta figurines essentially similar in pose as widely current in Egypt during the Ptolemaic and Roman periods (ca. 300 B.C.—300 A.D.):

> The figure is commonly represented as seated on the ground, the legs spread out so as to display the pudenda, . . . Sometimes the figure is squatting with knees raised and turned outwards. . . . In every case the outward spread of the thighs is essential. The pose of the arm varies: sometimes they are raised in the so-called "attitude of prayer," sometimes they are held forwards as in invitation; sometimes the hands are laid on the thighs to stretch the legs apart and so emphasize the pudenda.

These figures are found both in houses and in graves, i.e., they were for the use of the living and the dead: when found in graves, they are almost invariably in those of women; in houses, they are usually in the inner, i.e. the women's apartments. It is clear then that they were for the use of women, and Miss Murray suggests that they represent a goddess whose function was to stimulate sexual desire and thus indirectly to promote fertility. She remarks that figures of this type are not recorded in Egypt before the Ptolemaic period, during which the deities of the common people assumed an importance equal to that of the official pantheon.

Miss Murray identifies these images with the mythical personality Baubo, the woman who, in one version of the Demeter myth, causes Demeter to laugh by exposing her pudenda. Rose (1934) dissents from Miss Murray's view that the figure and name of Baubo are of Egyptian origin, and emphasises that Baubo belongs to the Orphic version of the Demeter myth. He notes that the name Baubo means "belly" or "womb" in Greek.

The Orphic texts relating to Baubo are expounded by Kerenyi (1951). In the canonical form of the myth Baubo is presented as a mortal woman, born of the earth; however, Kerenyi finds reason to suggest that in an earlier form she was an underworld goddess. Thus interpreted, Baubo appears to some extent comparable with Ereshkigal in the myth of Ishtar. The divinity of Baubo is strongly indicated by a text which states that Demeter perceived Baubo to be pregnant with the divine child Iakchos, the young god of the Eleusinian Mysteries. In other versions Iakchos is the child of Persephone, daughter of Demeter; thus Demeter, Persephone, and Baubo are different manifestations of the same goddess-type, the Great Mother.

The *Fasciculus* diagram (Fig. 1) is in the pose of the squatting Baubo figures with arms upraised, while its Persian counterpart (Fig. 2) follows the type in which the hands are laid on the thighs. It may be suggested that if, as Sudhoff considers, these anatomical diagrams were created in Alexandria, they were founded upon the Baubo figures and followed their variations in pose. The Orphic text which speaks of Demeter perceiving the child Iakchos in the womb of Baubo could be taken as providing a mythological justification for founding a pregnancy diagram on the Baubo figure.

Identical squatting figures, with hands either upraised or resting on the knees, occur very much earlier on Mesopotamian cylinder seals (Fig. 3). Neumann (1955) shows that these figures represent a goddess of fertility whose images are found with slight variation from Greece to Egypt, Mesopotamia, and India. Although the figures are not clearly represented as pregnant, James (1959) suggests that the squatting pose symbolises parturition.

A possible Egyptian precursor of the later Baubo figures is an alabaster vessel of the XVIIIth Dynasty, (*ca.*1570-1350 B.C.) described by Seligmann and Murray (1911). This represents the birth goddess Ta-urt squatting and holding in front of the pubis a hieroglyphic symbol which Murray and Seligmann believe to represent diagrammatically the uterus and vagina, but which could very well be converted into exaggerated pudenda (Fig. 4). Ta-urt, as Miss Murray (1934) points out, is the Great Mother in her pregnant form, and thus directly parallel to the pregnant Baubo. Allowing for adaptation to the vase form, this figure could well be linked with the "Baubo" type; it might possibly also be taken as foreshadowing the adaptation of the Baubo image into an anatomical diagram of the female reproductive tract.

Some grotesque female figures sculptured on mediaeval churches in the British Isles appear to be derived from the Graeco-Egyptian Baubo type (Murray, 1934). In most of these figures, usually known by the Irish name "Sheila-na-gig," the hands are placed in front of the thighs or near the pudenda, recalling the Ta-urt vase, but occasional specimens show the upraised arms of the *Fasciculus* illustration. Antiquaries differ as to whether these carvings, apparently peculiar to the British Isles, are of Celtic, Saxon, Norse, or Norman inspiration. Miss Murray adduces arguments for regarding the Sheila-na-gig, like the Egyptian Baubo figures, as designed to promote fecundity in women by stimulating sexual desire. A number of these Sheila-na-gig figures illustrated by Miss Murray show the bony structure of the thorax curiously emphasised; in one case, what Miss Murray interprets as a supernumerary pair of breasts appears more probably to be the costal margin. In the figures of the late 13th century Provençal five-picture series (Choulant-Frank, 1920) the thoracic basket is equally emphasised. Some oriental pregnancy figures also show horizontal lines across the chest (Fig. 2); it is not clear whether these are intended to indicate ribs, lungs, or breasts. It seems possible therefore that anatomical diagrams might have played a part in carrying the Baubo type of figure from the Mediterranean to northwestern Europe.

The figure of the female reproductive tract in the Italian *Fascicolo di Medicina* of 1493 makes concessions both to anatomical accuracy in depicting the uterus and to Renaissance naturalism in pose, the lady being recognisably seated on a chair, with one arm raised and one lowered. This figure was also published as a fugitive sheet (Crummer, 1923). A pair of fugitive sheets with superimposed flaps, representing the viscera in male and female, issued by Vogtherr of Strassburg in 1539 and frequently reprinted during the 16th century (Crummer, 1923), show seated figures with widely separated thighs; one hand rests on the knee, while the other is placed behind the thigh. It seems probable that these sheets are based on manuscript figures of the five-picture series.

I suggest, therefore, that the mediaeval pregnancy diagrams were created, probably in Alexandria, on the model of the Baubo figure, a form of the great Mother-goddess. From variants of this figure, two types of diagram developed, one with lowered, the other with raised arms; the former led up to the European and Oriental five-picture series and the Vogtherr fugitive sheets, the

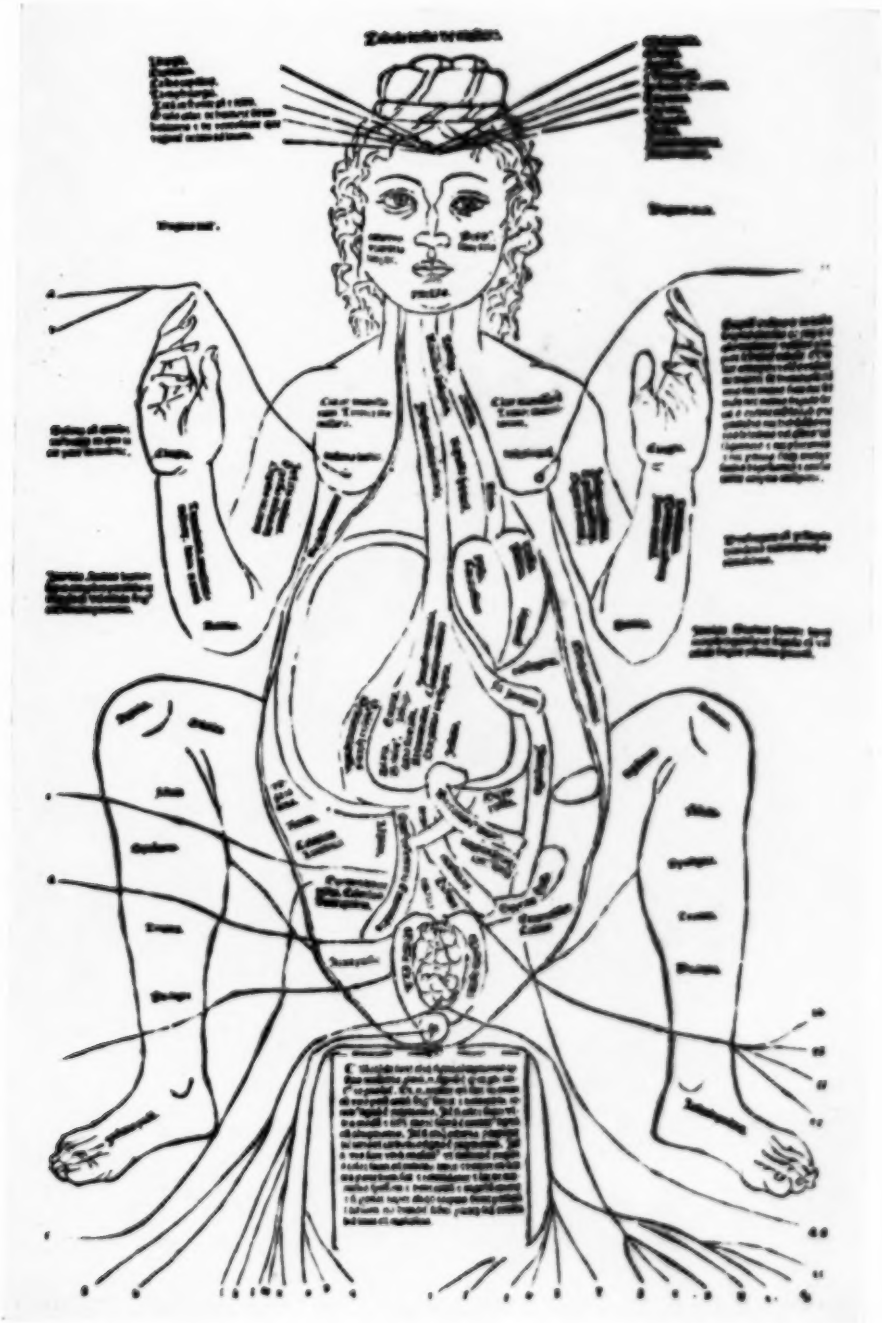

FIG. 1. Woodcut diagram of the internal organs in the female, from Ketham's *Fasciculus medicinae,* Venice, 1491.[6]

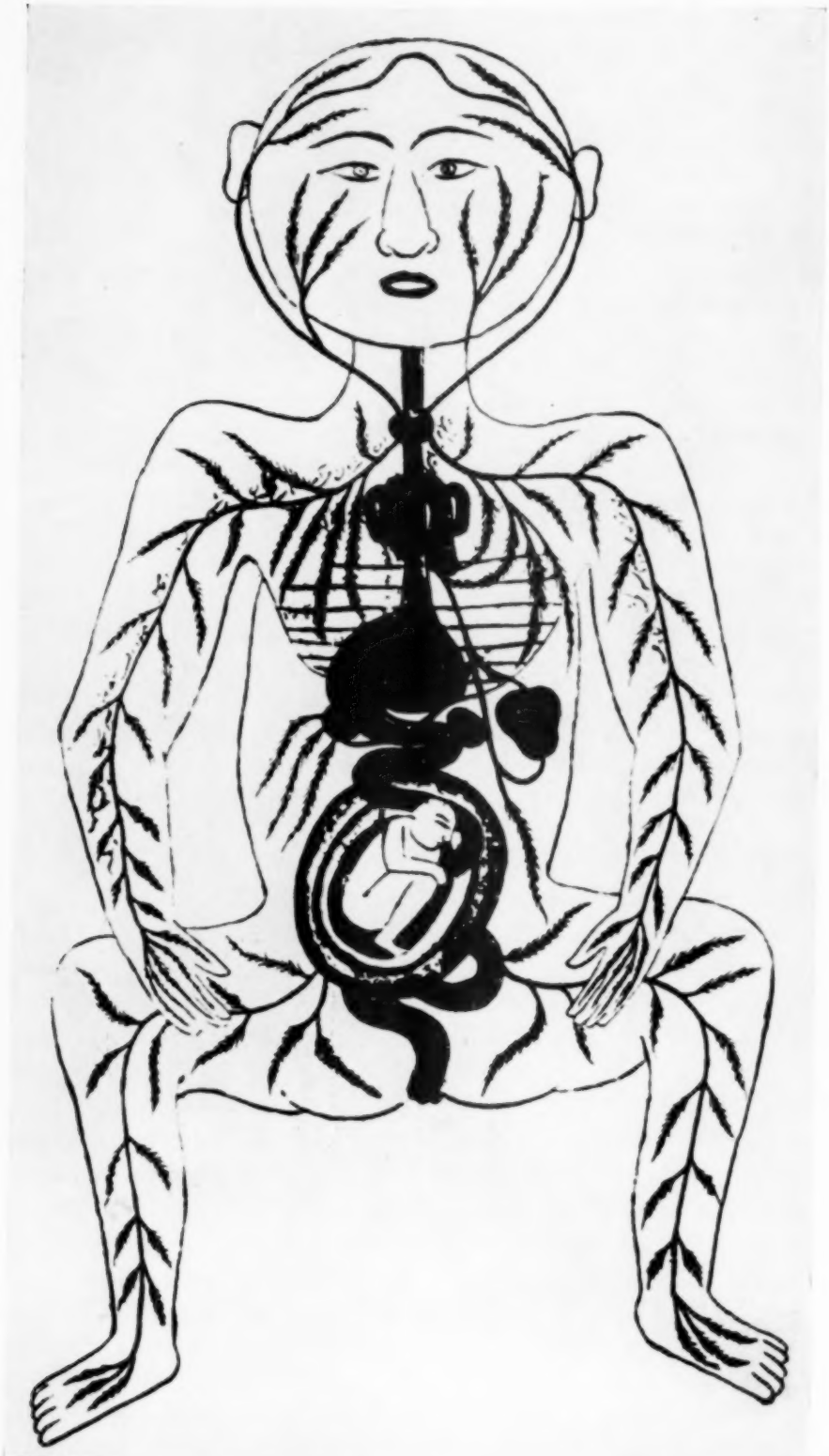

FIG. 2. Arterial system of a pregnant woman, from Persian manuscript. No. 2296, India Office, London.[1]

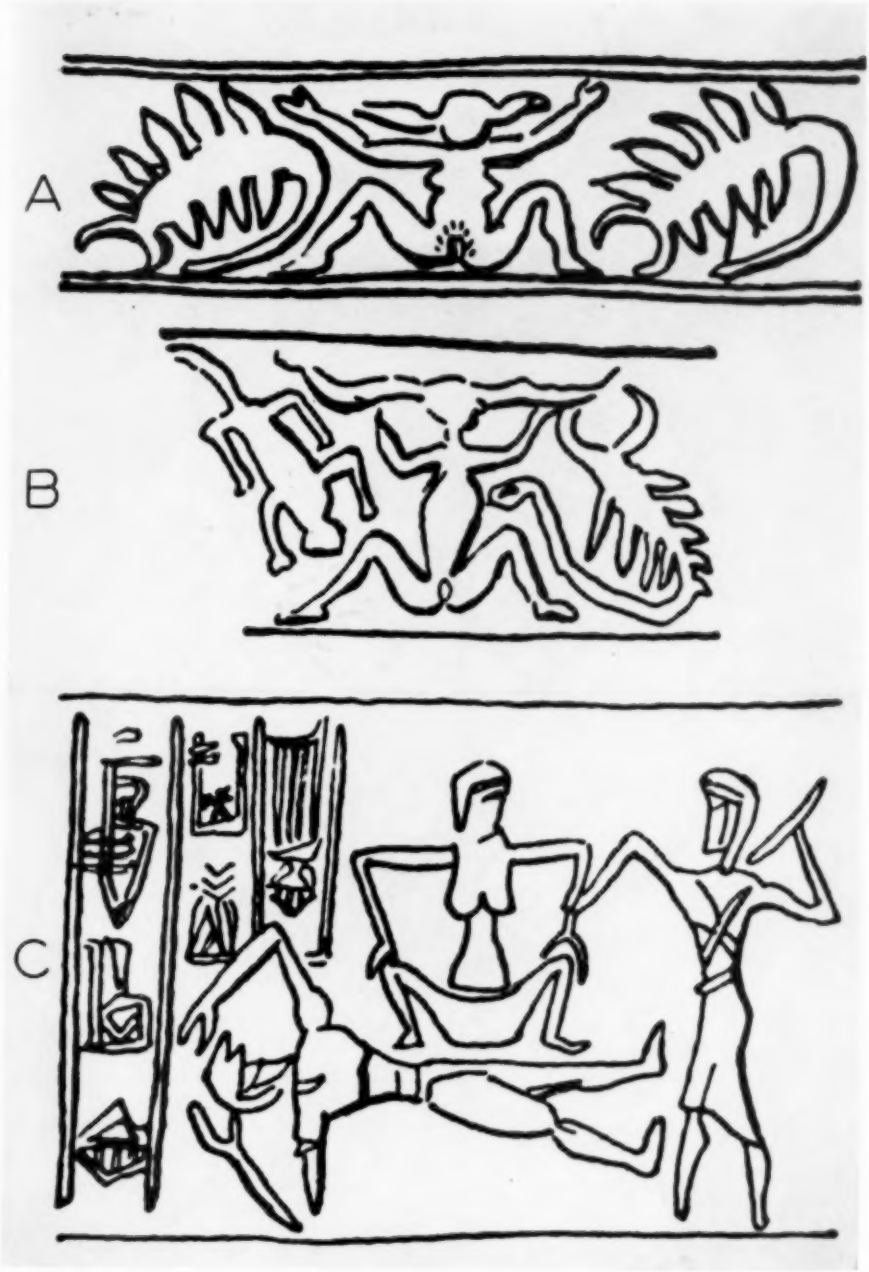

Fig. 3. Figures from Mesopotamian cylinder seals: A & B, Ur, C, Lagash.[8]

FIG. 4. Alabaster vase, Egypt. XVIII[th] Dynasty.[10]

latter to the *Fasciculus* figure of 1491. Anatomical diagrams of this character may also have been partly ancestral to the mediaeval Sheila-na-gig figures of the British Isles.

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Thoreau's Medical Vagaries

LAWRENCE WILLSON*

INTO a notebook in which he recorded quotations from the writing of authors whose sentiments were attractive to him, Henry David Thoreau, the sometimes irascible idealist of Concord, Massachusetts, copied these verses from a poem in Francis Quarles's *Hieroglyphikes of the Life of Man*, "The whole need not the physician":

> You that always are bestowing
> Costly pains in life repairing,
> Are but always overthrowing
> Nature's work by over-caring. . . .
>
> Nature knows her own perfection,
> And her pride disdains a tutor;
> Cannot stoop to art's correction,
> And she scorns a coadjutor. . . .
>
> But to make a trade of trying
> Drugs and doses, always pruning,
> Is to die of fear of dying;
> He's untuned that's always tuning.
> He that often lives to lack
> Dear-bought drugs, hath found a knack
> To foil the man, and feed the quack.[1]

Although the contemporary practitioner of medicine may like to recall that Quarles was characterized by Anthony à Wood as "an old philosophical poet . . . the sometime darling of our plebeian judgment," his word on the subject of health and the protection of health remained a kind of gospel for Thoreau, who never wavered in his belief that "the whole" indeed "need not the physician." And he was almost as certain that the sick needed him not, either. "Probably if our lives were more conformed to nature," Thoreau wrote, "we should not need to defend ourselves against her heats

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[1] These verses appear in a manuscript volume preserved in the archives of the Library of Congress as "Thoreau's Literary Note-Book." I quote them by permission. Although at least two other comparable notebooks survive: "Miscellaneous Extracts. . . . 1836-[1839]" preserved as MA 594 in the Pierpont Morgan Library, and another, Wakeman 985 (*The Stephen H. Wakeman collection of books of nineteenth century American Writers. . . .* [New York 1924]), recently acquired by the Berg Collection in the New York Public Library: this is probably the book described by F. B. Sanborn (*The life of Henry David Thoreau* [Boston and New York 1917], pp. 87-88) as having been compiled by 1843.

and colds, but find her our constant nurse and friend, as do plants and quadrupeds."[2]

In this and countless comparable statements he expressed his basic point of view toward health and the preservation of it and implied his attitude toward medicine and the practitioners of it. He was convinced that nature is "but another name for health" and that the healthy man will live in perfect correspondence to the various seasons, eating the foods which they provide, wearing the clothing which they suggest, seeking the seasonal shelter. To make one's body as perfect as possible, in order that it might be a fit companion for the soul, seemed to him to be a man's first duty. He resented any suggestion that this could not be accomplished by a strict conformity to natural law. Nature was perfect, of course, and man could be equally perfect if he, following nature, would forget that disease had any real existence. Disease could not co-exist with absolute truth and order. He admonished the world: "Measure your health by your sympathy with morning and spring."[3] Thus, for the preservation of his health—all kinds of it—he lived the earnestly carefree life of the natural philosopher, attempting to drive life into a corner and see what kind of fight it would then make for itself. "Must be out-of-doors enough," he declared, "to get experience of wholesome reality, as a ballast to thought and sentiment. Health requires this relaxation, this aimless life."[4]

The truth of the general observation seemed to be borne out not only by his own experience and his calculation as a scientist, but by the comments of the chroniclers, the old settlers in his village of Concord, and even some medical authorities. He noted in his Journal that Miss Minott, the sister of his good old friend who lived on the hillside across from Emerson's house, told him that Dr. Spring had told her that disease itself followed a pattern set by nature:

> that when the sap began to come up into the trees, *i.e.* about the middle of February (she says), then the diseases of the human body come out. The idea is that man's body sympathizes with the rest of nature, and his pent-up humors burst forth like the sap from wounded trees. This with the mass may be that languor . . . commonly called spring feelings.[5]

2 "A winter walk," *Excursions*, pp. 166-167 (My references to the published work of Thoreau are to the Walden edition of *The writings of Henry David Thoreau* [Boston and New York 1906] 20 vols. I have referred to the various volumes by their commonly recognized titles.)

3 *Journal*, *11*, 455. (In the Walden edition, Thoreau's *Journal* [Bradford Torrey, Ed.] is included as volumes 7-20, but with an alternative numbering: 1-14. I have used the alternative numbering.)

4 *Journal*, *4*, 409-410.

5 *Journal*, *7*, 239.

He was particularly delighted always to test his theories by personal experience. In the early part of February 1841, when he was still in the spring of life, he recorded proudly:

> Without greatcoat or drawers I have advanced thus far into the snowbanks of the winter, without thought and with impunity. . . . My diet is so little stimulating, and my body in consequence so little heated, as to excite no antagonism in nature.[6]

Exactly one week later, however, the happy theory of "natural" adjustment was blasted. Thoreau did not learn Dr. Spring's theory until fourteen years later; so the record simply and philosophically states:

> I am confined to the house by bronchitis. . . . Sickness should not be allowed to extend further than the body. . . . As soon as I find my chest is not of tempered steel, and heart of adamant, I bid good-by to these and look out a new nature.[7]

In between times he wrote airily to his friend Harrison Blake, "As for health, consider yourself well."[8] And struggling to bid good-bye indeed to the dying animal within its aging hide, he was annoyed when people insisted on talking to him about their physical ailments. He recorded his scorn of

> notional nervous invalids, who report to the community the exact condition of their heads and stomachs every morning . . . old betties and quiddles, if men . . . who . . . come to you stroking their wens, manipulating their ulcers, and expect you to do the same for them.[9]

But Thoreau was cursed with a weak and imperfect body. He was frequently ill, and no amount of Transcendental rationalization of the non-reality of disease could make him overlook that fact. He therefore took the bolder road of declaring, " 'Tis healthy to be sick sometimes."[10] "No doubt," he was finally forced to admit, "the healthiest man in the world is prevented from doing what he would like by sickness."[11] He averred, of course, that his illnesses were indicative of his lack of sympathy with nature. "In sickness all is deranged," he wrote.

> I had yesterday a kink in my back and a general cold, and as usual it amounted to a cessation of life. I lost for the time my *rapport* or relation to nature. Sympathy with nature is an evidence of perfect health.[12]

6 *Journal*, 1, 201.
7 *Idem*, p. 214.
8 *Familiar Letters* (F. B. Sanborn, Ed.), p. 186.
9 *Journal*, 9, 379.
10 *Journal*, 2, 143.
11 *Journal*, 8, 56.
12 *Journal*, 10, 188.

But his observation had taught him that nature itself is not immune to disease, and on the basis of this observation he was able to state that disease was at least not "unnatural." Indeed, he raised the pregnant question:

> Is not disease the rule of existence? There is not a lily pad floating on the river but has been riddled by insects. Almost every shrub and tree has its gall, oftentimes esteemed its chief ornament and hardly to be distinguished from the fruit.[13]

Disease was a part of divine law and therefore even beautiful. The contemplation of a pincushion gall on a young white oak inspired him to a moral homily of some comfort to the depraved.

> It is remarkable, [he wrote] . . . that a disease, an excrescence, should prove . . . the greatest beauty,—as the tear of the pearl. Beautiful scarlet sins they may be. Through our temptations,—aye, and our falls,—our virtues appear. . . . How many men meet with some blast in the moist growing days of their youth, and what should have been a sweet and palatable fruit in them becomes a mere puff and excrescence.[14]

He found beauty also in what he was later to learn much about, "the hectic glow of consumption."[15]

Having granted so much, he could grant further that, the perfect body being still desirable, it was both feasible and a part of good sense to *treat* disease. This was his conclusion during his bronchial seizure of 1841, which came as a conclusion to his "natural" behavior of the winter.

> The care of the body is the highest exercise of prudence. If I have brought this weakness on my lungs, I will consider calmly and disinterestedly how the thing came about, that I may find out the truth and render justice. Then, after patience, I shall be a wiser man than before.
>
> Let us apply all our wit to the repair of our bodies, as we would mend a harrow, for the body will be dealt plainly and implicitly with. . . . This matter of health and sickness has no fatality in it. . . .
>
> We do wrong to slight our sickness and feel so ready to desert our posts when we are harrassed. So much the more should we rise above our condition, and make the most of it, for the fruit of disease may be as good as that of health. . . .
>
> In sickness it is our faith that ails, and noble deeds reassure us.[16]

13 *Journal*, 2, 440.

14 *Journal*, 5, 210.

15 *Journal*, 9, 91.

16 *Journal*, 1, 221-222. Despite Thoreau's animadversions against consulting doctors, Emerson wrote of him at some point between 1845 and 1848: "Henry Thoreau is still falling on some bold volunteer like his Dr. Heaton who discredits the regulars; but Henry like all the rest of sensible men, when he is sick, will go to Jackson and Warren." (*Journals of Ralph Waldo Emerson*, 7 [Boston and New York 1912. Edward Waldo Emerson and Waldo Emerson Forbes, Eds.] 557-558.)

If disease was to be treated, moreover, it must be by "truly . . . Indian—botanic—magnetic or natural means."[17] If disease existed as a fact in nature, then the remedies for it must exist as facts in nature. If it was a cheerful and comforting thought that "Every flower that grows . . . by some remote dingle or pond side has virtues medicinal which do not have to be distilled from its roots, but . . . simply by its growing & blooming there our lives are constantly refreshed and invigorated,"[18] it was even more comforting—and exciting—to realize that we can with good expectation of success "seek for the medicines which will cure our ails in the plants which grow around us."[19] It was exciting to Thoreau to realize how this fact emphasized the intimate relationship of nature and man, how it further showed the easy botanical knowledge of country men and "the old woman who rarely goes out of the house," and how it simplified our economy by offering in our own back yards nostrums which we currently purchase from foreign countries at great expense. In the very last letter which he wrote with his own hand—to Daniel Ricketson, in October 1861—he characteristically deplored the taking of medicine: "One of the worst effects of sickness is, that it may get one into the *habit* of taking a little something . . . when he does not need it."[20]

He kept a voluminous record, from his reading and observation, of natural remedies for illness and preventatives of discomfort. "When your shoe chafes your feet," he noted, for example, "put in a mullein leaf."[21] On a trip to Brattleboro he was interested in a switch of leather-wood because he knew that it had served the Indians for rope, for thread to sew canoes, and as a purgative. On Mount Washington he found *Salix Uva-ursi* and noted that "with the southern Esquimaux it is reputed to cure scurvy."[22] From Cartier he learned of another cure for scurvy, the bark and leaves of the *Epinette blanche* (Anneda), which the French in Canada learned from the aborigines. From Peter Kalm's *Travels into North America* he learned of "that kind of maple which cures scorched wounds."[23] In a largely unpublished notebook one discovers such details, quoted from Loudon's *Encyclopedia of Plants,*

17 Ms Am 278.5. This manuscript, in the possession of the Houghton Library, Harvard University, I quote, here and elsewhere, by permission of the Librarian.

18 *Ibid.*

19 *Journal,* 2, 214.

20 *Familiar letters,* p. 395.

21 *Journal,* 2, 5.

22 *Journal,* 11, 17.

23 MA 595. This manuscript, preserved in the Pierpont Morgan Library under the title "Extracts from Works, relating to Canada," and commonly called "the Canadian Notebook," I quote by permission of the Trustees of the Pierpont Morgan Library.

as that rhexia is effective in the treatment of ruptures;[24] and on a page of an early manuscript of his first published book, *A Week on the Concord and Merrimack Rivers,* one reads: "Dandelions make an excellent green, blossoms & all, and are said to be good for the blood. . . . The fact is they [potatoe-tops, beet leaves, pigweed, &c] are all good for spring complaints." The concluding sentence is typical: "The present administration may be a bad one but this celandine is perpetually good."[25]

Thoreau's principal interest was obviously in "botanic" remedies, but he also noted others. He recorded in his Journal the belief that the secretion of a skunk is "a sure cure for the phthisic."[26] He observed also that among the lumbermen of Maine "red flannel is reputed to possess some mysterious virtues, to be most healthful and convenient in respect to perspiration."[27]

His travels in Maine with an Indian guide, Joe Polis, were especially instructive in teaching him about the medical practice of the Indian and the details of the aboriginal *materia medica.*

> Our Indian, [he reported enthusiastically], said that he was a doctor, and could tell me some medicinal use for every plant I could show him. I immediately tried him. He said that the inner bark of the aspen . . . was good for sore eyes . . . proving himself as good as his word.[28]

He learned much from Polis of ancient Indian lore and much he acquired also from his extensive program of reading in books of travel, histories, Indian chronicles, and various anthropological works during the last dozen or so years of his life. The eleven massive notebooks of manuscript, "Extracts, from works relating to the Indians,"[29] from which he apparently planned to prepare a monumental work on primitive people and their customs offer countless examples of his concern about all aspects of Indian medicine. He made a careful record, for example, of the habits of Indian women of all tribes in what the historian James Adair called their "lunar retreats." He wrote down details of their practice of abortion (induced by herbs), their use of such medicines as (according to Nicholas Bossu's *Nouveaux Voyages*) pulverized rattlesnake rattles to prevent pain during an accouchement and other quaint

24 This manuscript, one of Thoreau's "Fact-Books," is preserved in the Widener Room at Harvard University. It is a compilation of extracts from works of natural history.

25 Ms Am 278.5.

26 *Journal, 8,* 38.

27 *The Maine woods,* p. 31.

28 *Idem,* p. 259.

29 These so-called Indian Notebooks, compiled by Thoreau during the last decade of his life, between 1850 and 1860, are preserved in the Pierpont Morgan Library as MA 596-MA 606, inclusive. I quote from them by permission of the Trustees.

obstetrical customs, their genteel refusal to wean children often before the age of four or five. He noted always the superior strength of Indian women, quoting the Baron Lahontan's tale of the Miami squaw who brought in a three-hundred-pound buffalo with a newborn baby on top of it.

Wherever it was possible, he commented on the superior health and vitality of the Indian, who was never thought to be seriously ill, nor thought himself so, unless he refused food. In Notebook 1 he quoted Roger Williams's admiring statement that "The tooth ake is the only pain which will force their stout hearts to cry." In Notebook 4 he quoted Lahontan that the Indians are "of an unalterable health though they take no care to preserve it," and Father Charlevoix that they are

> Not subject to gout—gravel—stone—apoplexy—& c.
>
> Says it is folly to think their blood is colder than ours & hence they are more insensible—but it is very balsamic—& their flesh heals sooner.

He noticed in his research every comment on the excellence of the Indian's hearing, the sharpness of his eyesight, the soundness of his teeth, the sweetness of his breath, his freedom from "consumption" and other diseases,[30] his agility and endurance of great privation, his longevity, the rarity with which he was besieged by insanity, blindness, lameness, or any deformity—even left-handedness! In Notebook 8 he quoted John Heckewelder that the savages "Were unacquainted with the venereal disease before the whites came." Ultimately, of course, so vast was the scope of his scholarship, every comment has been balanced by its opposite. In Notebook 9, for example, John Lawson offers the rebuttal to Heckewelder, saying "that the Americans have for ages by their own confession had a distemper much like the Lues Venerea—& tells how it was introduced into Europe by the Spanish soldiers." How Thoreau might have resolved the many contradictions in his note, if he had lived to write his projected work, is of course the guess of any scholar. We can be sure that he would have blamed much of Indian sickness on the arrival of the white men with their decimating smallpox and rum. He wrote in Notebook 9 this comment on Thomas Hariot's *Briefe and True Report:*

[30] The Indian's treatment of consumption is perhaps obliquely described by Thoreau in this comment, written in 1859, "The savage in man is never quite eradicated. I have just read of a family in Vermont who, several of its members having died of consumption, just *burned* the lungs, heart, and liver of the last deceased, in order to prevent any more from having it." (*Journal, 12,* 356.) There is a note of pathos also in this comment, since several members of the Thoreau family, including Henry himself, died of this malady.

> The English remarked that in the towns where the Ind. had done them harm which they had not retaliated, a disease invariably broke out soon after their coming, which carried off many . . . but no whites. 'The like disease by report of the oldest men in the country never happened before'—hence the Ind. thought it the work of the Englishman's God . . . & wished the Eng. to punish *their* enemies in like manner—& though the Eng. refused to do this, similar consequences following their contact with such enemies—, the former Ind., thanked them never the less as if they had changed their minds & concluded to do them this service. Indeed it was as if mere intercourse with the whites caused a mysterious & peculiar disease which swept off the natives.

In *A Week on the Concord and Merrimack Rivers* he noted that disease had generally increased in the land since the arrival of the white men, who destroyed the "odoriferous native plants, sweet-scented grasses and medicinable herbs" that once wafted to the approaching voyager "the natural and original fragrance of the land," introducing in their stead grazing cattle and rooting swine. We can be sure also that Thoreau would have wished to prove the general truth of Hariot's comment on the Indians of Virginia: "They are very sober in their eating and drinking and consequently very long-lived, because they do not oppress nature." The Indian as the child of nature was the object of his whole-hearted admiration and his chief emulation—the Indian, that is, of older days. The modern Indian—even Joe Polis—was a glutton and an inheriter of all the other ills of civilization. When he got sick—for he did get sick—he lay under his canoe and groaned.

> It seemed to me [said Thoreau] that, like the Irish, he made a greater ado about his sickness than a Yankee does, and was more alarmed about himself . . . yet it was only a common case of colic.[31]

As the child of nature the Indian, of course, looked to nature, as Thoreau himself wished to do, for the medicines to cure his diseases. The Indian Notebooks abound in what amount to prescriptions quoted from the various authorities on matters aboriginal. Early in Notebook 1 the record starts with a note from Roger Williams:

> The 6 Nations observing that the musquash [muskrat] fed freely upon the hemlock without hurt, they took out the stomach of the animal, dried & pulverized it, and gave it to their children who had eaten of the plant, and found it to be an antidote for the poison.

In Notebook 3 we learn from John Josselyn that Indian women cure the "scalled" heads of their papooses "with a decoction made of the moss which grows at the root of the white oak" and cure gout

31 *The Maine woods*, p. 320.

or "any great ache" by burning the patient with "spunck." In Notebook 5 Thoreau quotes from Dr. Thomas I. Williamson's contribution to Part I of Henry R. Schoolcraft's monumental *Historical and Statistical Information respecting . . . the Indian Tribes of the United States* such details as that the Dacotas treated a sick stomach by tickling the patient's throat with a feather; and in Notebook 6 he notes from Father Paul LeJeune's *Relation* for 1636: "Says they have skill in curing ruptures." In Notebook 8 he quotes from John Heckewelder's *An Account of the History, Manners and Customs of the Indian Nations . . .* [of] *Pennsylvania, and the neighboring States* the somewhat recondite information that, in preparing an emetic, the water must be drawn *up*stream; for a cathartic, it must be drawn *down*stream. From George Henry Loskiel's *History of the Mission of the United Brethren* he notes that rattlesnake broth is good for consumption. In Notebook 9 he observes, from the Jesuit *Relation* for 1655-1656, that the Iroquois considered an application of the rattles of the rattlesnake excellent for toothache; from C. E. Potter's *History of Manchester* [New Hampshire], that the Pennacooks found watermelon efficacious in the treatment of fevers; from John Lawson's *A New Account of Carolina,* that the savages there cured their children of eating dirt by feeding them a dose of roasted bat. Over and over again he quotes details of the Indian practice of "sweating" in steam baths, which Father Charlevoix called the Indian's "great remedy" and which Father LeJeune called "the best of their medicines." The chronicle leads one eventually to wonder whether Thoreau was being sardonic when he wrote in his Journal in 1852 that "impunity in respect to . . . death or disease . . . sickness or casualty, is only to be attained by moral integrity. It is the faith with which we take medicine that cures us."[32] Elsewhere he noted, in Notebook 7, tales told by Father LeJeune of Indians in the hospital, who generously passed their medicine around among the other patients and visitors.

The secret of health, as Thoreau and the aborigines well knew, was the cultivation of a mind free from care. An Indian told the Baron Lahontan, as Thoreau recorded in Notebook 4, that people died of fear. "While if we treated the ill as a trifle, as well as death . . . without doing a violence to nature with our drugs, we should recover." In an early manuscript of "A Yankee in Canada" he wrote in comparable vein, concerning the naval battle of Plattsburg in 1814:

32 *Journal*, 4, 157.

Silliman, who made his tour to Quebec in 1819 . . . speaking of this battle states "on the authority of an American surgeon who attended upon the wounded of both fleets," that "the Americans recovered much faster than the British, where their injuries were similar. . . . This was imputed to the different state of mind in the victors and in the vanquished." This remark . . . is one of many which betray a readiness to admit the dependence of matter on mind . . . a sort of . . . universal common transcendentalism which . . . the faculty would not be willing to confess.[33]

Thoreau was careful to record the descriptions of the various kinds of medicine men—physicians, jugglers, prophets—and as far as he could to describe their functions and to gather data concerning their success. In Notebook 9 he copied the conclusion of Lawson with regard to Indian doctors that "He 'never knew their judgment fail.' " His personal conclusion he had suggested earlier, in Notebook 6: "The medicine man is indispensable to work upon the imagination of the Indian by his jugglery—and of like value for the most part is the physician to the civilized man." He suggested it also in *A Week on the Concord and Merrimack Rivers:* "In the most civilized countries the priest is still but a Powwow, and the physician a Great Medicine." After reading James G. Swan's *The North-West Coast,* he wrote in Notebook 9—perhaps rather sadly—"Ind. of Oregon do *not* kill their doctors when they fail, as asserted." But there is soon a note of reassurance, in Notebook 10, offered by Major Alvord, writing of the Nez Percés in Part V of Schoolcraft: that among the Waskows it is common practice to kill the doctor if the patient dies.[34]

Thoreau placed doctors beside ministers as insincere and useless men:

When the priest departs from administering consolation, the physician comes to close the eyes. And when he departs the priest returns to bury the body, and when he is gone again, the physician returns to dig it up & dissect it. A Dr & a minister—what a pair of friends![35]

Death, too, was natural and should be accepted naturally. His point of view is further expressed in this extended comment:

The physician thinks only of preserving the body—the priest of preserving the soul—but none thinks ever of preserving the soul by the sacrifice of the body, and so it falls between two stools. Is not Death a sovereign remedy? For certain disorders I should write—"Kill the patient." I should

33 HM 949. This manuscript, the "Complete First Draft of . . . A Yankee in Canada," is preserved in the Huntington Library, San Marino, California. I quote from it by permission. Thoreau repeats the same detail in MA 595, the so-called Canadian Notebook.

34 Another wry—and familiar—note he quoted in Notebook 7 from J. E. Fletcher, an Indian Agent (in Schoolcraft's Part IV), regarding the physicians of the Winnebagoes: " 'The doctors— — — charge exorbitant fees, —'."

35 Ms Am 278.5.

put him out of misery as I would an insect. To insult and defile and poke at a sick man with your medicine . . . how much kinder and cleaner it would often be to cut his thread.—Turn out the physician and the priest and let a man die in piece—without dirty drugs to defile or prophane words to disturb him. If his sun sets serenely stand aside and wait in patience. If it is likely to be too prolonged an agony, shocking to humanity to witness, gently cut his thread and let him go—if you respect *life,* if that is sacred in your eyes. . . . I have heard of some who were 15 years a dying—a shiftless business, for which neither gods nor mortals have any sympathy to spare.

At any rate, I rather like to hear of a man's dying as he has lived, though it were never so early. There was one of my neighbors who bothered his watchers—when he was hourly expected to die—by trying to sell them his hay. After an earnest & natural conversation about hay grain & oats & their prices, he would break. . . out with, "And now O Lord teach me to pray. Prepare me for the great change." And . . . having given this subject the attention it deserved return to the more interesting one . . . what oats were going to fetch this fall.[36]

But Thoreau was, of course, ahead of his time in some ways, possibly even in one or two of his attitudes toward medicine and health.

[36] *Ibid.*

Notes and Events

Edited by Dorothy M. Schullian*

Alexander von Humboldt and Brunonianism

In the year 1780 the *Elementa medicinae* of John Brown appeared in Edinburgh, but it became known on the European continent only after a decade. Immediately it provoked a great stir and divided physicians into two camps of opinion, pro and contra. If one considers the history of Brunonianism at the turn of the century, one notices with surprise that in Germany alone the number of books published pro and contra Brown in little more than a decade (from 1796 to 1808) exceeded 200; therefore it is necessary to agree with Rudolf Virchow, who compared the stir caused by the publication of the *Elementa* to the effect of an earthquake.[1] Virchow said that the whole European continent was shaken by Brown's theory and that it brought even the physicians of the New World under its yoke. Brown was indeed celebrated as a reformer by many contemporaries, who considered him the founder of the true science and even compared him with Newton. It was stated by a contemporary source that as Newton discovered the laws of inorganic matter, so Brown illuminated the great plain laws of life.[2] How did these "laws of life" look?

Brown, misinterpreting and generalizing Haller's physiologically determined irritability, put this phenomenon as the center of the life process. The stimulus is, according to Brown, the motive of life and the origin of all diseases. He does not consider life as a natural state, but only as a condition enforced by stimuli. He calls the body's ability to react to stimuli "incitabilitas," excitability, and states that this is localized in the marrow of the nerves and in the muscles, which he arbitrarily designates as the "nervous system"![3] But at the same time this power is evenly distributed throughout the whole body—an important point of his doctrine. The product of stimuli and excitability is "incitatio," excitement. Any deviation—"sthenia" and "asthenia"—from the moderate and normal degree of excitement, which he calls health, leads to illness. The quality of the stimuli can be completely ignored, as the quantity alone is decisive.

Thus a common denominator had been found for the vital phenomena. The physicians were enthusiastic about this simple and, for them, con-

* Cleveland, Ohio.

1 Virchow, R. Die Stellung der Pathologie unter den biologischen Wissenschaften. *Berl. klin. Wschr.* 1893, *30*, 321-324 and 357-360.

2 Brown, J. *System der Heilkunde*. C. H. Pfaff, Ed. 2d ed. Kopenhagen, Proft und Storch, 1798, p. 7.

3 I have used the edition of Moscati: *Joannis Brunonis elementa medicinae*. Cum praefatione Petri Moscati. Editio in Germania secunda. Hildburghausen, I. G. Hanisch, 1805, pp. 5, 18, 3.

vincing theory, about the fact (known for quite some time but not yet formulated as onesidedly as this) that external stimuli can excite the organism to react, and, last but not least, about the simple rules applicable for therapy. That explains the enormous effect which the Brunonian system had on the whole medical world.

Alexander von Humboldt could not be silent regarding this fashionable rage, for Brown's theory drastically contradicted his own observations and experiments on stimulation.[4] With the clear and critical attitude of the scientific investigator he reproved Brown's monomania, pointing out clearly the weaknesses of the Brunonian system and remaining throughout objective and impersonal.[5] He was justified in his warning not to try to determine the nature of disease at that stage of physiological and pathological research. It would be too audacious an undertaking, he said, to limit the definition of the human pathological conditions to the vague conceptions of strength and weakness, of "sthenia" and "asthenia," and to designate them by only one term. Humboldt saw that the "incitabilitas" which governed the whole system of Brown was a very hazy conception. Brown sometimes called it a quality of the living matter, sometimes a material added to the organism. Humboldt contrasted Brown's doctrine with Morgagni's question of the localisation of disease. "As long as pathogeny has not yet been scientifically established, so long is it better to describe the diseases according to the external changes of the particular organic systems than to reduce every change to the vague and relative conceptions of strength and weakness."[6] It may be noted here that Humboldt himself often used Brown's terminology and spoke of sthenia and asthenia, of direct and indirect weakness, proof that, at that time, Brown's terms were generally accepted in medical terminology.

Humboldt proved convincingly by his own experiments that several of Brown's theses contradicted the simplest laws of physics and chemistry. Warmth, for instance, could never cause contraction of organic matter, wrote Humboldt, but expansion. According to Brown warmth increases the tone of the muscles and contracts the vessels. How could it be possible, Humboldt continued, that Brown ignores the quality of the stimulus, since the stimuli are so manifold? Brown had completely overlooked the chemical changes in the solid and fluid parts of the body. "This failure to consider the chemical relations of organic matter" was the climax of Humboldt's criticism of the system. "This hyperphysical treatment of a physical matter," he wrote, "is undoubtedly the major mistake of Brown's *Elements*."[7]

[4] Humboldt, A. v. *Versuche über die gereizte Muskel- und Nervenfaser nebst Vermuthungen über den chemischen Prozess des Lebens in der Thier- und Pflanzenwelt.* 2 vols. Posen and Berlin, 1797.

[5] *Ibid.*, vol. 2, pp. 75-89.

[6] *Ibid.*, vol. 2, p. 83.

[7] *Ibid.*, vol. 2, p. 86.

At that time opinions rejecting Brunonianism were in the minority; therefore Humboldt's thorough and astonishingly mature critique of the Brunonian system should be appreciated so much the more. Although Brown's German translator Christoph Heinrich Pfaff had already written a criticism of the *Elementa* which was masterly in form and content, and had pointed out the many weaknesses of the stimulus doctrine, which was only apparently accurate,[8] other important physicians accepted Brown's theories; among them was Joseph Frank, the slightly eccentric son of the great Johann Peter Frank.[9] Undoubtedly the opinion expressed by Johann Peter Frank himself regarding Brunonianism was largely responsible for the fact that the speculative stimulus theory was not immediately banned from scientific medicine. In the year 1797 Frank wrote a long preface for his son's book, which was presumably more influenced by fatherly love than by conviction. Humboldt knew the preface and in his critique referred to it. In this preface Frank neither completely accepted the theory of John Brown nor did he reject it. "Much of what this sagacious brain [Brown] has produced," he wrote, "I approve of fully, but I am not pleased with all. I make use of the good and I throw the chaff away—but not ungratefully in the face of the praiseworthy man."[10]

Nor did Humboldt do this, but in his critique he tried to be just with system and author. Undoubtedly his convincing criticism helped to overcome the dogmatic Brunonianism, though at first the applause and enthusiasm for Brown's work dominated the critical voices. "Alas, it is not given to all to fathom a prevailing error. The crazier the folly, as long as stated daringly, the more numerous its followers."[11]

Brunonianism could be upheld longest in Germany, where the romantic period willingly accepted the doctrine and tried to make use of it. It is understandable that Brown attracted just these circles, because his closed system, which resembled the romantic conception of polarity, was in full accord with the "ideal pathology" of that time and with the observation of the sick individual as a whole. Only around 1810 did the craze for Brunonianism abate.

GERNOT RATH

8 Pfaff, C. H. Abhandlung über Browns System der Arzneiwissenschaft. In: Brown, J., *System der Heilkunde*. C. H. Pfaff, Ed. 2d ed. Kopenhagen, Proft und Storch, 1798, p. 3-77.

9 Frank, J. *Ratio instituti clinici Ticinensis anno 1795*. Viennae, 1797.

10 Frank, J. *Heilart in der klinischen Lehranstalt zu Pavia*, mit einer Vorrede von Johann Peter Frank. Aus dem Lateinischen übersetzt von F. Schäfer. Wien, J. Camesina & Co., 1797, p. 40.

11 Thus in 1840 the neuropathologist Gustav Adolf Spiess, the opponent of Rudolf Virchow, wrote of the Brunonian system (Spiess, G. A., *J. B. van Helmonts System der Medizin, verglichen mit bedeutenderen Systemen älterer und neuerer Zeit*. Frankfurt a.M., 1840, p. 351).

Alexander Porphyrievich Borodin, 1833-1887

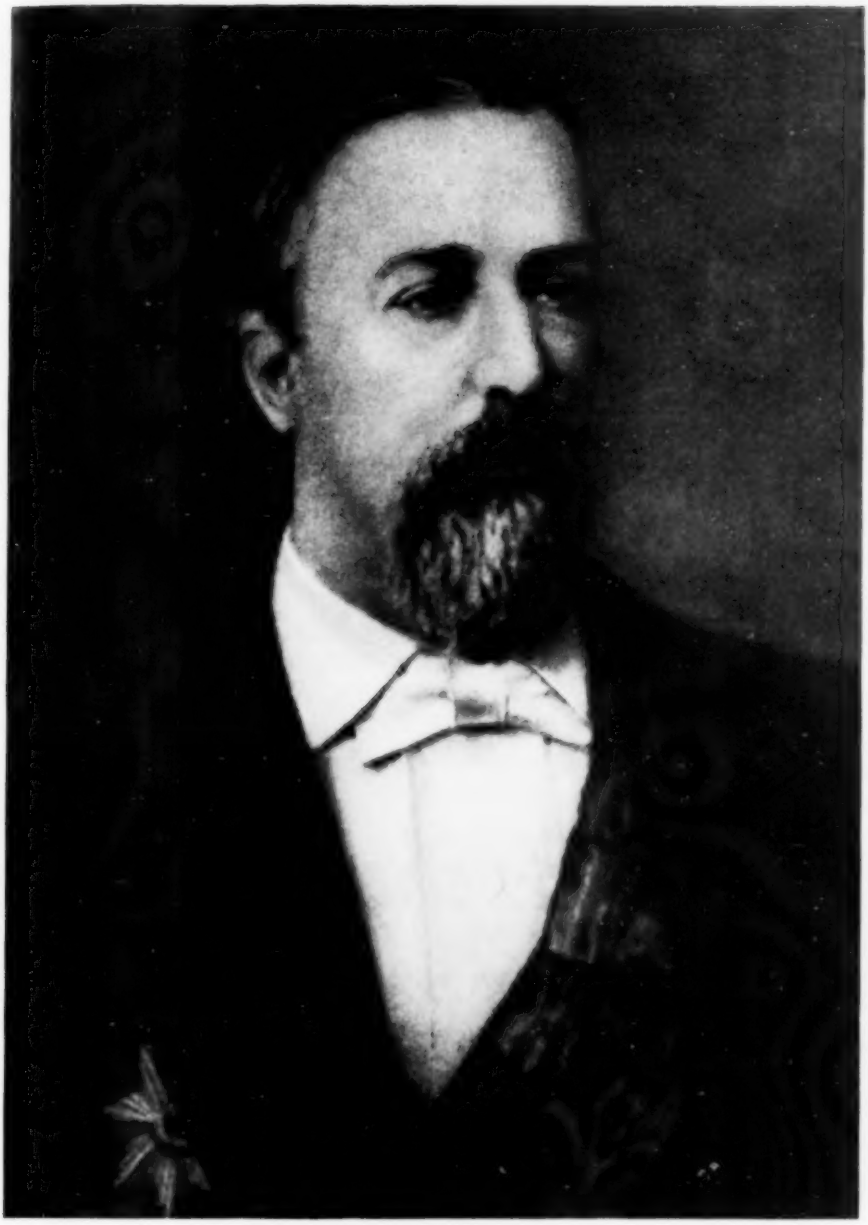
The successful pursuit of bilateral careers, one in an art and the other in a science, has been achieved by some. In most cases, however, these have been consecutive rather than concurrent accomplishments, the arts career usually representing a pastime or hobby in youth and not pursued with avidity until the twilight years. Not infrequently a lifetime's occupation, crowned with widespread recognition and acclaim, is placed gently into the background while the newer and perhaps thereby more stimulating challenge is taken up with greater interest and energy. It has in the past been said that "you make a mistake to hunt two hares at once."

Alexander Porphyrievich Borodin, for one, hunted, caught, cooked, and lived to eat both his hares. His life was characterized by a truly remarkable blend of music and medicine, and so well integrated were his talents in both fields that it becomes difficult in a study of the man to separate the two, though they appear to have exerted little influence upon each other. It is as if two men, identical save for divergent interests, simultaneously but independently scored successes in their respective endeavors.

Borodin was born in St. Petersburg, Russia, on 12 November 1833, the third of three illegitimate sons of a 61-year-old Georgian prince and a 25-year-old beauty from Narva. In the interests of propriety the boys' names were derived from a registry of serfs belonging to their father, and they were officially listed as peasant offspring, each boy carrying a different surname. Eccentric though Borodin's origins were, they were never a source of embarrassment to him, and throughout his life they were a matter of open discussion.

The man's naïveté, geniality, and complete disinterest in matters which he considered of small importance are demonstrated by the fact that from middle age to the day he died he believed himself to have been born in 1834 and, in fact, this is the date inscribed on his tombstone. Subsequent research has established 1833 as the correct year, the misconception stemming from an incident which took place on his 40th birthday in 1873. He had written to his wife remarking on the occasion when he was informed by an elderly servant of his mother's that he erred by one year and was, in truth, only 39. Thereafter he allowed himself the vanity of being one year younger with no further attempt to verify the validity of either date. This was in sharp contrast to his meticulous scientific investigations.

Because of frailty in his youth (he matured into a robust and strong man) and the suggestion of consumption, his early education was received at home, at the hands of private tutors and governesses, but under the guidance and encouragement of his mother. Dark of skin and hair and possessed of an Oriental quality in his eyes which gave rise to an impression of sleepiness, he was by all accounts his mother's favorite. It is to her credit that Borodin's early experiences were sufficiently broad to include



Alexander Porphyrievich Borodin

(Courtesy of the Library of Congress)

stimulation in both arts and sciences. Almost from the outset his interests were divided between music, botany, and chemistry, his introduction to music being via the flute and to science by way of a home-made apparatus with which he manufactured fireworks and made pigments with which he painted. His first musical composition, a polka dedicated to an older woman, is preserved in manuscript, and though written when he was only nine is reputedly striking in its originality.

During adolescence, without the benefit of formal instruction in the basic structure or techniques of composition, he composed a concerto for flute and piano and later a trio for two violins and cello. Nonetheless, largely through the insistence of his mother, he embarked upon a projected medical career and in 1850, at the age of seventeen, began his studies at the Academy of Medicine and Surgery at St. Petersburg. Chemistry was his forte, and having received an appointment as assistant to the Professor of Pathology and Therapeutics in 1856, he completed his thesis on the analogy between arsenious and phosphoric acid and was graduated with honors, receiving his M.D. degree in 1858.

During the next three years he traveled through Italy, Germany, France, and Switzerland, advancing his scientific studies and publishing medical papers, as well as writing several (unpublished) pieces of chamber music. Not the least of his accomplishments during this period was the finding of a wife, the sensitive and musically talented Catherine Protopova, a woman for whom he held an enduring affection and who contributed immeasurably to his musical maturity. It was she who introduced him to the compositions of the great German and French composers.

Nineteenth century Russia was characterized by the last vestiges in Europe of the medieval contrast between a completely depressed working class and an absolutely autocratic ruling class. Less than ten per cent of the land was privately owned, the remaining bulk being held in control by the Czar, the royal family, and the nobility. And it was the second estate only which had attained the imprint of western civilization. The serfs were the more sharply differentiated by their lack of education and their completely non-western attitudes and way of life. As a 19th-century minister of education said, "Education is harmful to a people born to obey."

The retarded development of the Russian art form, in both literature and music, was in a large measure dependent upon this schism between the upper classes and the serfs, the former preferring to converse in a foreign tongue (French) and dismissing their own rich national culture "with a shrug and the suggestion that it belonged to the stables and barns of a mujik." Partly because of the need for champions of a national and truly Russian musical culture, and partly as a result of a series of fortuitous coincidences and happenstance meetings, there was formed in St. Petersburg, the cradle of the nationalistic movement, a group of composers who

came to be known as *Les Cinq, The Mighty Five,* or *Moguchaya Kuchka* (The Mighty Little Heap). It was in 1865, the year after he was appointed a titular Professor at the Academy of Medicine, that Borodin made the acquaintance, which was to flower into warm friendship, of Rimsky-Korsakov. These two, with Mussorgsky, Cui, and Balakirev, made up *The Mighty Five.*

It is to *Les Cinq* that the credit must go for the instigation, popularization, and world-wide recognition of the delightfully melodic and lyrically beautiful Asiatic and Oriental quality which was instilled into the previously stultified and often rigidly formal Russian music. And all this was accomplished in the face of the resistance and bitter criticism of such popular and well-established adversaries as Tschaikovsky. Of the group, though Balakirev was the acknowledged leader and guiding stimulus, only three, Mussorgsky, Rimsky-Korsakov, and Borodin, emerged with international acclaim. The *Symphony in E Flat Major,* the first draft of which was completed by Borodin in 1862, the same year in which he was appointed assistant professor of organic chemistry, was finished and presented to the public in 1867, and is one of the earliest works to gain fame for Russian music in other countries.

Two years later he began work on his opera *Prince Igor,* an opus of great scope and beauty, unfortunately left unfinished by him but later completed by the joint efforts of Rimsky-Korsakov and Glazunov. The same year he devoted a great deal of his time and energies to the establishment of an Academy of Medicine for Women, the first of its kind in Russia, believing as he did that women deserved equivalent professional opportunities. This is particularly noteworthy in view of the present status of the Russian woman in medicine where men are outnumbered three to one.

Despite a multitude of family obligations, an apartment well stocked with pet tomcats, solicitous and soliciting medical students, society women bent on exploiting his time for charitable purposes, two careers, either one of which would have sufficed most men, and a kind and easy-going manner which left him prey to a variety of distractions, he managed to leave behind an impressive musical legacy. This consists principally of two symphonies, several very fine songs, the orchestral tone poem *In the Steppes of Central Asia* (the music of which was in part used in 1953 for the successful Broadway musical production *Kismet* and from which the popular songs *Stranger in Paradise* and *Baubles, Bangles and Beads* were derived), and the opera *Prince Igor.*

On 15 February 1887, while entertaining friends, colleagues, and students, the self-styled "Sunday composer" fell suddenly to the floor and died, the victim of diseased coronary arteries. Though medicine was his avowed

profession and music his "fun," his imprint on both fields has endured for nearly a century.

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M. MICHAEL EISENBERG

Addenda to the Early History of Hypnotic Anaesthesia

George Rosen has written an authoritative account of the early use of hypnotic anaesthesia, emphasizing the British and French experience.[1] In this article he mentions the well-known case of a woman who had her breast removed by Jules Cloquet on 12 April 1829. This operation is apparently not the first recorded use of hypnotic anaesthesia, however, for it is reported that a Dr. Recamier performed an operation using hypnosis in 1821.[2] It is the purpose of this supplementary note to fill in the American history of hypnotic anaesthesia during the years 1836 to 1845.

The first American procedure took place nearly two years prior to the first one reported in England in 1838, and was a result of the proselyting activities of Charles Poyen, who enthusiastically introduced mesmerism to New England in early 1836.[3] This first recorded case of hypnotic anaesthesia in the United States occurred on 28 June 1836, when a 12-year-old girl had a tooth pulled painlessly after being magnetized by Monsieur B. F. Bugard, a friend and fellow French teacher of Charles Poyen. This operation was witnessed by Drs. Ware, Lewis, and Glover of Boston.[4]

Most of the early operations performed under hypnotic anaesthesia, like the one cited above, involved dental procedures. It is likely that these were the first to be attempted because of their limited scope, and they consequently did not test the efficacy of the anaesthesia in more profound surgery. The next account came from a surgeon-dentist of Providence, one Dr. Eston. Providence also had been on the itinerary of Poyen's lecture tour. In the summer of 1837 Dr. Eston removed four roots of broken teeth without difficulty and later cut off teeth and put in pegs for artificial teeth

1 Rosen, George. "Mesmerism and surgery: A strange chapter in the history of anesthesia." *J. Hist. Med.*, 1946, *1*, 527-550.

2 Goldschmidt, Margaret. *Franz Anton Mesmer: The history of an idea.* London, Arthur Barker, 1934, p. 184.

3 Carlson, Eric T. "Charles Poyen brings mesmerism to America." *J. Hist. Med.* (accepted for publication).

4 West, Benjamin H. "Experiments in animal magnetism." *Boston med. surg. J.*, 1836, *14*, 349-351.

without inflicting any pain.[5] He reported a more bizarre case in the fall of 1837.[6] He had filled the tooth of a woman under hypnosis, but the ache continued when she was awakened. After several days she was again hypnotized, and she spontaneously asked for a knitting needle. She heated this in a flame and drove the point down into her gums, killing the nerve and thereby eliminating the pain. Even during her own operative approach she showed no sign of hesitation or discomfort. Dr. J. K. Mitchell of Philadelphia was reported to have painlessly pulled a tooth from a magnetized patient on 12 March 1839,[7] and a few years later, in 1843, a Dr. Barrett of Forrestville, New York, reported that he had removed teeth from two mesmerized patients with similar success.[8]

Poyen's influence was also to be felt in another area of medicine. During his visit to Nashua, N. H., he had interested a Dr. C. Cutter in mesmerism. On 9 January 1837, Dr. Cutter was called in to attend a woman who had been in irregular labor for 48 hours.[9] The patient was exhausted and in much discomfort. Dr. Cutter decided to try hypnosis, and managed to induce sleep within one minute. The patient slept for three hours and awoke spontaneously feeling very refreshed. Much to their surprise, the observers noted that while she was hypnotically asleep her contractions continued regularly. There is no evidence, however, that Dr. Cutter kept her under hypnosis during the rest of her labor, or that he utilized this procedure in other cases of imminent delivery. The next reference one can find to the use of hypnotic anaesthesia in obstetrics comes several years later. Dr. William B. Fahnestock of Lancaster, Pennsylvania, reported in 1846 that he had started to use hypnosis for women in labor in 1844.[10] He reported eight patients for whom labor had been made painless by mesmerism. He especially recommended this procedure as he felt that there were fewer complications in the post-partum period.

Regular surgical operations were the last to be tried under the anaesthesia produced by hypnosis. The earliest report we have is one of July 1843, when a polyp was removed from the nose of a patient without the slightest sign of pain.[11] On awakening, the patient had no awareness of what had been done. This operation was performed in Belfast, Maine, with Phineas Parkhurst Quimby serving as hypnotist. Like Cutter, Quimby had become interested in hypnotism several years earlier through the efforts of Charles Poyen, and is well known for his treatment of Mary Baker

5 Deleuze, J. P. F. *Practical instruction in animal magnetism,* translated by T. C. Hartshorn. New York, D. Appleton and Co., 1850, pp. 292-293.

6 *Ibid.,* pp. 348-350.

7 Combe, George. *Notes on the United States of North America during a phrenological visit in 1838-9-40.* Edinburgh, Maclachlan, Stewart, & Co., 1841, II, p. 145.

8 Deleuze, *op. cit.,* pp. 364-365.

9 *Ibid.,* p. 282.

10 Fahnestock, William B. "Artificial somnambulism in Pennsylvania." *Boston med. surg. J.,* 1846, *35,* 194-203.

11 Wheelock, Albert T. "Experiment in animal magnetism—removal of a polypus from the nose." *Boston med. surg. J.,* 1845, *32,* 260-261.

Eddy. Also, about this same time, a Dr. George B. Rich of Bangor, Maine, removed a two-inch tumor from the right shoulder of a woman who showed slight uneasiness under hypnosis, but no evidence of pain; she also had no recollection of the experience.[12] Several months later, in the same city, Josiah Deane amputated a leg successfully under mesmerism.[13] Another tumor was reportedly removed in Richmond, Virginia, in November 1845.[14] Two other operations under hypnotic anaesthesia had been performed in the previous month in Richmond without any evidence of pain. Also in Augusta, Maine, sometime after 1843, a two and one-half pound tumor was surgically removed with no awareness by the patient.[15]

After 1845 there was an increasing number of reports of hypnotic anaesthesia in the United States. Many of these were reported in the British journal *Zoist* and are discussed by Dr. Rosen in his article.

ERIC T. CARLSON*

Librarium, 1959, II, Heft 2

The Revue de la Société Suisse des Bibliophiles or Zeitschrift der Schweizerischen Bibliophilen Gesellschaft, as it announces itself bilingually on its cover, appears three times a year under the becoming title *Librarium*. The second issue (August) of its second year of publication will be of particular interest to medical historians in the United States.

The issue, sumptuously printed and illustrated, and prepared with the assistance of Erwin H. Ackerknecht, contains the following articles in honor of physicians who have loved books: Robert Herrlinger, "Über die Bibliophilie der Ärzte," pages 68-74; W. J. Bishop, "Le Dr. William Salmon (1644-1713) et sa bibliothèque," pages 79-83; John F. Fulton, Frederick G. Kilgour, and Madeline E. Stanton, "Die Medizinische Bibliothek der Universität Yale," pages 87-102; Erica Campanella-Sigerist, "Mein Vater und seine Bibliothek," pages 103-105.

Additional items related to books and their fascination supplement these articles, and the ultimate purpose of the issue, and in fact of any collection of books and even of the study of history, is set forth on page 86 with the lines which were composed by the Reverend George Stewart in 1941 and which are inscribed over the fireplace in the Historical Library of the Yale University School of Medicine. They can fittingly be repeated here:

12 Deleuze, *op. cit.*, p. 397.

13 Deane, Josiah. "Amputation of the leg in the mesmeric state." *Boston med. surg. J.*, 1844, *30*, 194-197.

14 Deleuze, *op. cit.*, p. 403.

15 *Ibid.*, p. 404.

* From the Department of Psychiatry of the New York Hospital (Payne Whitney Clinic)—Cornell University Medical College, New York, N. Y. This investigation was supported in part by a Research Grant (M-2146) from the National Institute of Mental Health, U.S. Public Health Service.

Here, silent, speak the great of other years, the story of their steep ascent from the unknown to the known, erring perchance in their best endeavor, succeeding often, where to their fellows they seemed most to fail;

Here, the distilled wisdom of the years, the slow deposit of knowledge gained and writ by weak, yet valorous men, who shirked not the difficult emprize;

Here is offered you the record of their days and deeds, their struggle to attain that light which God sheds on the mind of man, and which we know as Truth.

Unshared must be their genius; it was their own; but you, be you but brave and diligent, may freely take and know the rich companionship of others' ordered thought.

THE SABIN AND MENDENHALL PAPERS

It is a pleasure to report here that the papers of Florence Rena Sabin, a biography of whom was contributed by Vincent T. Andriole to a recent issue of the Journal (1959, *14*, 320-350), have been given to her alma mater, Smith College, by Dr. Harvey Swan of Denver, Colorado. They include both professional and personal records, and although they are less full on her early years and on the period at Johns Hopkins, they document copiously her life and activities from 1925 to 1951. They contain, according to a recently published annual report of the Friends of the Smith College Library, all of her published work and many manuscripts of her studies at the Rockefeller Institute, her addresses and notes for lectures, discussion meetings, radio talks, and interviews, travel notes, engagement books, memorabilia and photographs, awards and tributes, files of correspondence and reports on the work of organizations which she served and associations of which she was a member, and letters from scientific colleagues and personal friends.

The papers have been placed in the Sophia Smith Collection, which comprises over 500,000 documents on the intellectual and social history of women. Dr. Sabin was a friend and fellow-student, at the Johns Hopkins Medical School, of Dorothy Reed Mendenhall; the two were graduated third and fourth in the class of 1900. It is highly appropriate that the papers of Dr. Mendenhall, whose brilliant career was centered in the field of public health and pediatrics, and in particular of child nutrition, have also been deposited in the Sophia Smith Collection, the gift of her sons Thomas C. and John T. Mendenhall. Those covering her work with the Children's Bureau in Washington in the years 1917 to 1920 will be of very special value. On 1 July 1959 Thomas C. Mendenhall became the sixth president of Smith College.

Historical Notes in the American Journal of Cardiology

The *American Journal of Cardiology* is continuing its series of historical notes first mentioned in this journal (1959, *14*, 90-91) when the titles for 1958 and 1959 were listed. The following are scheduled to appear in 1960:

Sir William Broadbent on Pulseless Disease (1875)—February.

Obstruction of the Thoracic Duct by Aortic Aneurysm (Turner, 1859; Laennec, 1806)—April.

Armand Trousseau on Acute Articular Rheumatism—June.

The Treatment of Angina Pectoris by Electricity (Duchenne, 1855)—August.

Thomas Bevill Peacock on Dissecting Aneurysm (1843)—October.

An Encyclopedic Treatise on Embolism (Bernhard Cohn, 1860)—December.

Each note reproduces, wholly or in part, a document illustrative of some phase in the development of cardiology. The text is accompanied by a brief introduction and by concise comment which serves to indicate the place of the author and his work in the advance of cardiological knowledge.

Saul Jarcho

Historical Gleanings

In their article "Notes on a New Edition of Michaelis: Ancient Marbles in Great Britain, Part Three: 2" (*American Journal of Archaeology*, 1959, *63*, 329-348 and Plates 77-86) C. Vermeule and D. von Bothmer include (pp. 332-334) descriptions of the following objects in the Wellcome Historical Medical Museum: 1) A version, seventeenth century or later, of the puteal with Bacchic scenes in the Prado, Madrid; 2) Statuette of Nike, marble, on a large orb (Pl. 78, Fig. 2); 3) Attic votive relief, Pentelic marble, ca. 350 B.C., in memory of a deceased person; 4) Statuette of Asklepios, Parian marble, work of the period 200 B.C.-A.D. 50; 5) Statuette of Asklepios, Crystalline island marble, late second to third century A.D.; 6) Statuette of Asklepios, Italian marble; 7) Statuette of Asklepios, "Thasian" marble, second or third century A.D.; 8) Statuette of Sylvanus, Luna marble; 9) Several small heads of Sarapis; 10) Marble relief depicting a mother nursing her young child, first century A.D.; 11) Votive tablet to Sarapis, "Thasian" marble, second or third century A.D.; 12) Porphyry foot from a colossal statue; 13) Double herm of Herakles and Alexander the Great, island marble, Roman imperial work; 14) Copy in heroic size of an early transitional head of a goddess, possibly Artemis, Parian marble, resembling

work of ca. 50 B.C.-A.D. 50. Additional sculptures are mentioned, and a survey of the museum's small but interesting collection of Italo-Corinthian, Attic, South-Italian, and Etruscan vases is provided.

Tradition was broken when on 10 June 1959 the first class to graduate from the Albert Einstein College of Medicine of Yeshiva University, instead of taking the Oath of Hippocrates, chanted in unison as a statement of ethic and principle the Declaration of Geneva. This vow enjoins against using "medical knowledge contrary to the laws of humanity" and permitting "considerations of religion, nationality, race, party politics or social standing to intervene between duty and patient."

In *Proceedings of the American Philosophical Society*, 1959, *103*, 537-544 Thomas R. Forbes examines passages on the prediction of sex in the foetus in such authors as Hippocrates, Soranus, and Rhazes and compares with them folk practices in various countries. His concluding sentences emphasize an eternal aspect of human nature: "Thus the record of man's constant, driving curiosity to know the sex of the unborn child. Of course he need wait only a few weeks or months to have the indisputable answer. But curiosity, in ancient Egypt as now, has little patience; then and now man has foretold the future as best he can."

A. E. R. Boak continues in *Historia* (Wiesbaden), 1959, *8*, 248-250 his studies of the effects on population statistics of the plague which was at its height in Egypt in A.D. 171-174, during the reign of Marcus Aurelius. Using poll tax registers and also records of certain other taxes and calculating for the village of Karanis he concludes that the plague inflicted a population loss from which it would have taken many generations to recover.

Benedict Einarson has contributed to *Classical Philology*, 1959, *54*, 258-259 a note on the Latin translation of Galen's *De propriis placitis*. This translation, from the Arabic, is known in four manuscripts, one of which, in Dresden, perished in the last war. Of 794 lines of text in the Latin, only 40 per cent is recoverable in Greek excerpts. Dr. Einarson points out that, presumably because the conclusion of the work was wanting in the archetype, some reader filled out the last page with an extract from the pseudo-Aristotelian *De pomo*.

Attention is called to Vern L. Bullough's "The Development of the Medical Guilds at Paris," in *Medievalia et Humanistica*, 1958, *12*, 33-40. This article is based in part on Professor Bullough's unpublished doctoral dissertation, *Medical Education in Western Europe during the Thirteenth and Fourteenth Centuries*, which was presented at the University of Chicago in 1954.

Pearl Kibre discusses in *Speculum*, 1959, *34*, 238-247, as a supplement to her preliminary survey of 1942 in the same journal, further manuscripts containing alchemical tracts attributed to Albertus Magnus.

The Welsh medical treatise Hafod 16, which belongs to the Cardiff Public Library, is in course of publication by Ida B. Jones, with a facing English translation, in *Études Celtiques* (1955, *7*, 46-75; 1956, *7*, 270-339; 1958, *8*, 66-97); at least one installment is still to follow. The manuscript, which is imperfect at beginning, middle, and end, was written about 1400 and contains 112 pages devoted to formulae for exorcising ailments, lists of plant names with their properties, recipes, the influence of the signs of the zodiac on various members of the body, rules of diet, and discussions of digestion, strangury, the four humors, uroscopy, and the like. Medical texts in the Welsh language are fairly numerous, but very little of such material has been published.

In *Speculum*, 1959, *34*, 639-640 Lynn Thorndike calls attention to a medical manuscript of the 15th century in the University Library at Basel (D.III.1) from which we learn that the same teacher was instructing a group of students successively in the elements of ethics, the natural philosophy of Aristotle, and the practice of medicine.

Medical historians working with early Italian printed sources have a new and very useful tool in the *Short-Title Catalogue of Books Printed in Italy and of Italian Books Printed in Other Countries from 1465-1600 Now in the British Museum* (London, Trustees of the British Museum, 1958). It is also encouraging to learn, from his article in *The Book Collector*, 1959, *8*, 140-146, that Dr. Dennis E. Rhodes, Assistant Keeper in the Department of Printed Books, is preparing a companion volume for the period 1601-1700.

The agricultural writer and reformer Gervase Markham (1568?-1637) is known to readers of this journal mainly for his publications in the field of veterinary medicine. He did also "paraphrasticall translations" in verse, expanding, e.g., one line from the *Song of Solomon* into an entire stanza in his *Poem of Poems*. His *Devereux* (1597) contains verses which have been incorrectly attributed to Christopher Marlowe though Markham himself names Geneviève Pétau as author of the French original of the work. F. N. L. Poynter in *The Times Literary Supplement* for 16 October 1959 establishes the identity of this lady and gives a brief outline of her life.

Into *The Scholastic Curriculum at Early Seventeenth-Century Cambridge* (Cambridge, Harvard University Press, 1958) William T. Costello, S.J. has put far more than the title covers; he has indeed furnished much material on the entire intellectual outlook of the time, and readers of this journal will turn in particular, in the chapter on graduate studies, to pages 128-135, which treat of medicine. Notes for this section occur on pages 196-198. No more than "comparative mediocrity" in this field can of course be claimed for Cambridge in this century, and the answer is one which administrators might still heed today, that "great teachers [not buildings] make a great university." Cambridge could not compete with Padua in

this respect, and yet the author proceeds to show that mediocrity is not inconsequentiality, and that not even inconsequentiality can "be predicated of a seventeenth-century university which can claim such names as Helkiah Crooke, Sir George Ent, Francis Glisson, William Briggs, Clopton Havers, Thomas Wharton, William Croone, Martin Lister, Walter Needham of Trinity College, George Jolyffe, James Drake, Humphrey Ridley, Edward Tyson, the incomparable Thomas Sydenham, and Sir Samuel Garth." The author uses in illustration passages from student notebooks in Cambridge libraries.

To the *Journal of American Folklore,* 1958, *71,* 532-540 Harrison Parker contributed an article entitled "The Scobs Was in her Lovely Mouth." The line occurs in the international ballad "Fair Mary of Wallington," which recounts the story of a maiden determined never to marry because five of her sisters had died in childbed. She was forced by her mother, however, to take a husband, and nine months later the mother was summoned to Mary's castle only to find that "The scobs was in her lovely mouth,/ And the razer in her side." By this despairing resort to Caesarean section the heir was saved, but "Tho the cradle it be full spread up,/ The bride-bed is left bare." The procedure of gagging the patient by a "scob" of cross pieces of wood, or by a silver spoon or silver ball, was designed to keep her mouth open in accordance with the popular notion that the infant breathed in the womb and that air should be provided to it when the mother was dead. Reputable physicians who knew anatomy long deferred to the notion in order to appease the populace; Pierre Dionis, e.g., deemed the procedure useless but recommended against omitting it.

That disreputable physician from Devonshire, Dr. John Wolcot, who under the pseudonym Peter Pindar satirized in verse the mores and personalities of eighteenth-century England, has received of late a sizable amount of attention in literary quarters. One entire chapter is devoted to him by Kenneth Hopkins in *Portraits in Satire* (London, Barrie Books, 1958), and Tom Girtin provides a biography in *Doctor with Two Aunts* (London, Hutchinson, 1959).

The statue of Edward Jenner by W. Calder Marshall, R.A., which is now located in Kensington Gardens in London, was originally erected, by popular subscription from many countries, in Trafalgar Square in 1858. There it aroused a storm of controversy which reached the halls of Parliament. Many thought it deserved no place among the naval and military leaders of the country; the Editor of the *British Medical Journal,* on the other hand, maintained that "if the publicity of the situation of an effigy should be measured by the universality of the benefit the original has conferred on mankind, . . . no statue that is or can be placed in Trafalgar Square could for one minute compare with that of the illustrious discoverer of vaccination." Subsequently, in 1862, the statue was suddenly removed

to its present location. The controversy is examined by Borden S. Veeder in *The Journal of Pediatrics*, 1959, 55, 252-256.

To the Festschrift *Alexander von Humboldt. Studien zu seiner universalen Geisteshaltung* (Berlin, Walter de Gruyter & Co., 1959), which was edited by Joachim H. Schultze for the Gesellschaft für Erdkunde zu Berlin, Heinrich Schipperges contributed on pages 36-68 an article entitled "Humboldts Beitrag zur Medizin des 18. Jahrhunderts."

The final United States stamp of 1959, issued on 3 December in sheets of seventy and totaling 12,000,000, commemorates the ovariotomy performed by Ephraim McDowell at Danville, Kentucky, in December 1809. Danville was appropriately the place of its first-day sale. The 4-cent maroon stamp, designed by Charles R. Chickering of the Bureau of Engraving and Printing, carries the portrait of McDowell, the words "United States Postage" in white-face Gothic in the top border, the name "Ephraim McDowell" in dark-face Gothic to the right of the portrait, and a large "4c" in white-face Gothic in the lower left. The stamp is one in the "Famous Americans" series which was inaugurated in 1940.

The sesquicentennial of the birth of Oliver Wendell Holmes (1809-1894) was commemorated by an exhibition at the Library of Congress 1 October-31 December 1959 which embraced not only his essays, poems, novels, and letters but also his medical contributions. The exhibition is described in *The Library of Congress Information Bulletin* for 28 September 1959.

Because William Beaumont's *Experiments and Observations on the Gastric Juice* (1833), although published at Plattsburgh, New York, had its inception at Fort Mackinac, Michigan, it has been accorded a listing in Albert Harry Greenly's *A Selective Bibliography of Important Books, Pamphlets, and Broadsides Relating to Michigan History* (Lunenburg, Vermont, Stinehour Press, 1958). Mr. Greenly's work, incidentally, is characterized by Howard H. Peckham, director of the William L. Clements Library at the University of Michigan, as that rarity among bibliographies, one which can be read.

The many medical historians who have benefited by the contributions of Moritz Steinschneider (1816-1907) in the fields of mediaeval Hebrew and Arabic literature and bibliography may wish to read the appreciation of him by Paul Oskar Kristeller in *Proceedings, American Academy for Jewish Research*, 1958, 27, 59-66. Professor Kristeller describes his significance for the intellectual history of mediaeval and Renaissance Europe. In the same issue, pages 67-81, Franz Rosenthal discusses his contribution to the study of Muslim civilization. Steinschneider, who lived before the days of grants-in-aid, was proud of the fact that only once did he receive advance support for his literary activities.

As part of its celebration on the centenary of publication of *The Origin of Species* the American Philosophical Society included the following papers in its *Proceedings*, 1959, *103:* Sir Charles Galton Darwin, "Some Episodes in the Life of Charles Darwin," pages 609-615; William Irvine, "The Influence of Darwin on Literature," pages 616-628; Irvin G. Wyllie, "Social Darwinism and the Business Man," pages 629-635; Conway Zirkle, "Species before Darwin," pages 636-644; John C. Greene, "Darwin and Religion," pages 716-725.

On 22 September 1959 the President of the United States signed into law a bill providing for the erection of a memorial tablet to Dr. Samuel Alexander Mudd on the site of the prison at Fort Jefferson, Florida, where in 1867 he heroically served his fellow-prisoners in an epidemic of yellow fever. Dr. Mudd, who on 15 April 1865 had given medical assistance at his home in Maryland to John Wilkes Booth, was released from the prison in 1869 and lived quietly at his home until his death in 1883.

In *Cahiers d'Histoire Mondiale*, 1959, *5*, 116-146 Richard H. Shryock examines the relations between medicine and society in the nineteenth century, and specifically at its advent, from 1815 to 1875, and from 1875 to 1900. In each of these periods he includes the following themes: the influence exerted by society upon health; disease trends as social phenomena; the reaction of these trends upon society; the impact of society on medical thought and practice; efforts made to cure disease through folk practice, religious healing, and science; the development of medical professions and institutions; programs for extending medical care to special groups and to the poor at large; efforts made to prevent disease through personal hygiene, public hygiene, and preventive medicine; the net influence exerted by medicine upon society. His story pertains chiefly to Europe and America, and especially to the former. He concludes that at the end of the century "medical science was *about* to reduce mortality and to increase life expectancy on a mass scale."

On 29 July 1959 Robert B. Anderson, Secretary of the Treasury, presented a gold medal to the widow of Dr. Roger Post Ames, the New Orleans physician who in 1901 at an experimental camp outside Havana used the experience gained in Louisiana to combat yellow fever. His services had not previously received official recognition.

One chapter in medical history was closed with the death in New York, on 11 October 1959, of Dr. Hermann Vollmer. Dr. Vollmer developed at Mount Sinai Hospital the Vollmer patch test, to detect tuberculosis, which was so widely administered to students in colleges and universities of the country.

On 15 October the 1959 Dexter Award in the history of chemistry was presented in London to John Read, professor of chemistry at the University of St. Andrews. The award, which is administered by the American

Chemical Society and carries a prize of $500, was established by the Dexter Chemical Corporation to recognize "noteworthy contributions to the advancement of the history of chemistry." Professor Read, who is the first person outside the United States to receive the award, has continually stressed the value of chemistry as a humanistic subject of great educational value.

The American Academy of Arts and Sciences again offers three prizes of $1,000 each to the authors of especially meritorious unpublished monographs in the fields respectively of the humanities, the social sciences, and the physical and biological sciences. The final date in 1960 for receipt of manuscripts is 1 October; announcement of awards will be made in December. Recipients will be expected to make their own arrangements for publication. Full details may be procured by sending a stamped, self-addressed envelope to the Committee on Monograph Prizes, American Academy of Arts and Sciences, 280 Newton Street, Brookline Station, Boston 46, Massachusetts.

Each year the American Institute of the History of Pharmacy conducts, in co-operation with the Committee on Historical Records of the American Society of Hospital Pharmacists, a competition "in recognition of special interest in preserving and interpreting the record of the development of hospital pharmacy and competence in writing." The awards went this year to Sister Mary Rebecca, O. S. B., St. Benedict's Hospital, Ogden, Utah, for her paper "A Brief History of the Utah Chapter of the American Society of Hospital Pharmacists" and to Sister Mary Junilla, O. S. F., St. Francis Hospital, Santa Barbara, California, for her paper "The Founding and Evolution of Queen of Angels Hospital Pharmacy, Los Angeles, California." Sister Mary Junilla lived only one week after the formal presentation ceremony.

The new Health Code of the City of New York became effective on 1 October 1959. Three and one-half years in preparation and five hundred pages in length, it replaces a Sanitary Code which dated back 93 years and which had been last revised in 1914. It is designed, in the words of the Health Commissioner, Dr. Leona Baumgartner, "to provide adequate protection and at the same time allow for the flexibility that encourages business and technological development." No longer need barbers provide spittoons for customers, and no longer, if a horse dies on the street, need the owner leave a red light overnight to mark the spot. In announcing the new code Dr. Baumgartner paid tribute to the late Dr. Haven Emerson, whose work as Health Commissioner from 1915 to 1917 and as member of the Board of Health from 1937 to 1957 contributed largely to the formulation of the code.

Editorials in *The Times Literary Supplement* for 6 March and 4 September 1959 express concern at the present level of scientific writing.

Where the founders of the Royal Society determined to make the fulsome literary language of their day serve the needs of science by insisting on good plain writing, and where Thomas Sprat in his *History* inveighed against vicious abundance of phrase, stricken metaphors, and volubility of tongue, little of the primitive purity, positive expressions, clear senses, and native easiness which they exacted is apparent in scientific reports today. The chemist cannot write, "I took a test tube"; he must say, "A test tube was taken." Snags of jargon appear, and the unavoidable technical term, which is often long and unwieldy, may induce like characteristics in the prose in which it is embedded. The long word when a short one would have served, the long way round in syntax, the cliché in case of doubt—such are the practices too often adopted. There are of course honorable and glowing exceptions. Possibly the solution will be scientific scribes, university-trained not in any one science but in the history, methodology, and modes of expression of all sciences and equipped to "organize the essential literary output of research establishments whose workers are often so hard pressed that there is a permanent back-log of writing."

In our issue of July 1959 (*14*, 394-395) it was reported that the professor of history, vice-chancellor, and lighthouse keeper of Tristan da Cunha had asserted his independence against an element which desired to reform the history syllabus on that desolate island. It is to be hoped, however, that he will welcome a reform in another field. Queen Elizabeth of England, having learned that an organ presented by her grandmother, Queen Mary, no longer functioned dependably, has promised a new instrument to the Anglican parish there. Communicants number 236; Tristan has a population of 261.

The *Pittsburgh Press* for Sunday, 16 August 1959 carried a feature article on the Rachel Hunt Botanical Library, which will be located in the penthouse of the projected main library, a gift of Mr. and Mrs. Roy Arthur Hunt, at the Carnegie Institute of Technology. On completion Dr. George H. Lawrence, director since 1951 of the Liberty Hyde Bailey Hortorium at Cornell University, will assume duties as first director of the Rachel Hunt Library.

In a series of six lectures 19 October-5 November 1959 at the College of Medicine, University of Cincinnati, Loren C. Eiseley spoke on the inclusive subject "Man's Quest for Certainty." In the separate lectures he set forth respectively how the world, death, life, and man became natural and discussed the questions "How Human Is Man?" and "How Natural is 'Natural'?" Professor Eiseley, who was serving on these occasions as Visiting Professor of the Philosophy of Science, is Chairman of the Department of Anthropology at the University of Pennsylvania and Curator of Early Man at the University Museum. His paper entitled "Charles Darwin,

Edward Blyth, and the Theory of Natural Selection" was published in *Proceedings of the American Philosophical Society*, 1959, *103*, 94-158.

There is a vast literature on premature burial, and examples of concern over the peril have already been set forth in this journal (1948, *3*, 161-171) by Howard Dittrick of beloved memory. Another was almost furnished on 17 June 1959 by a crowded bus making a regular run from Rome to Velletri. Since with the best use of his elbows a workman in a hurry to reach Velletri had been unable to force his way inside the bus, he climbed to the top where amid valises, cartons, and baskets of vegetables he was able to accommodate himself with a relative degree of comfort. In the course of the run, however, a downpour of rain induced him to lift the lid of an empty coffin which had been stowed away with the other baggage and crawl inside. Here he traveled blissfully, secure from the elements, and from here he emerged dry and happy at Velletri, to the utter terror of more conventional occupants of the bus who were convinced, as they saw the lid of the coffin rise, that the Day of Judgment had unexpectedly and relentlessly arrived.

National Hospital for Nervous Diseases, London

In June 1960 the National Hospital for Nervous Diseases, Queen Square, London W.C. 1, is celebrating the centenary of its opening. Founded in November 1859 by the philanthropic efforts of the Chandlers, two sisters and a brother, for "the Paralysed and Epileptic," it was the birthplace of British neurology and rapidly became a center for teaching, famous throughout the world. Before the turn of the century the hospital numbered among its famous physicians and surgeons such men as Brown-Séquard, Hughlings Jackson, William Gowers, David Ferrier, Charlton Bastian, and Victor Horsley. Many other members of the staff have achieved a prominent place in the annals of medicine.

To mark the occasion there has been arranged for the week 20-25 June a program of lectures and demonstrations devoted to the historical development and present status of neurology and allied sciences, as well as social events, for which invitations have been sent as far as possible to all old Queen Square men and others, including individuals and societies, prominent in the field. Further details may be obtained from the Senior Physician, Dr. Macdonald Critchley, at the hospital.

In Honor of Ephraim McDowell

Christmas Day 1959 was the 150th anniversary of the beginning of abdominal surgery. In 1809 Dr. Ephraim McDowell, operating on Christmas so that "the prayers of all the world, rising to God, would create a propitious atmosphere," removed Jane Todd Crawford's ovarian cyst. Historians have since been amazed, not so much that anyone attempted the

deed, but that it was done in a small Kentucky town on the American frontier. Danville, Kentucky, although grown far beyond the settlement of 1809, has carefully preserved the memory of Dr. McDowell. His home was previously restored, and now the Kentucky Pharmaceutical Association and the State Medical Association have joined forces to rebuild and restore the small brick building that served McDowell as a combined office and pharmacy.

The generosity of local residents and of the Charles Pfizer and Company pharmaceutical firm has provided a superb collection of early apothecary jars. The outstanding feature of the restoration is the homogeneity of the collection—all the items are of the period (1795-1830) when McDowell practised medicine in Danville. There is an outstanding display of English Delft jars and Wedgwood Queensware. A leech jar, early surgical instruments, and one of the country's two copies of the *Pharmacopaeia Edinburghensis* of 1737 round out the exhibit.

Dedication ceremonies were held on 14 August, and the occasion was further marked by the announcement that the Post Office would issue a commemorative stamp honoring Dr. McDowell. The stamp is a 4¢ denomination and was released in Danville on 30 December.

ROBERT J. T. JOY

Portrait of Dr. Stanhope Bayne-Jones

"B.-J. Day" was celebrated on 11 December 1959 at the Yale Medical Library with the unveiling of the portrait of Dr. Stanhope Bayne-Jones, by Deane Keller, which was mentioned in the Journal, 1959, *14*, 380.

Vernon W. Lippard, Dean of the Yale University School of Medicine, presided at the ceremony. Prof. John R. Paul spoke for the School of Medicine, Prof. John S. Nicholas for Trumbull College, and Brigadier General Joseph H. McNinch for the Medical Department, United States Army. Mr. Wilmarth S. Lewis accepted the portrait for The President and Fellows of Yale University. The program, which carries a reproduction of the portrait, was designed by Carl Purington Rollins, Printer to Yale University Emeritus.

The Editor's 60th Birthday

To mark Dr. Fulton's 60th anniversary on 1 November 1959 a small group of his friends, mostly dating from the 1930's, planned, had printed, and presented him with a booklet, *The Making of a Library. Extracts from letters 1934-1941 of Harvey Cushing, Arnold C. Klebs, John F. Fulton.* The revealing correspondence between these three men that led eventually to the establishment of the Historical Library is filled with quiet but unexpected drama and the perusal of the 70 pages is not without excitement. One hopes that some day a larger selection may be published from the letters of these three men to one another.

The present volume was edited by Madeline E. Stanton, Elizabeth H. Thomson, and Whitfield J. Bell, Jr. It was designed by Carl Purington Rollins, long-time friend of H. C. and J. F. His guidance and the co-operation of the Printing-Office of the Yale University Press and the Meriden Gravure Company made possible the manufacture of the book in less than two months.

Notes for Reviewers

In response to requests, the History of Science Society has arranged for a reprinting in pamphlet form of the late George Sarton's article, "Notes on the Reviewing of Learned Books," which originally appeared in *Isis*, 1950, *41*, 149-158. These reprints are now available, at 35¢ each, from the Editor of *Isis*, University of Washington, Seattle 5, Washington.

Kremers and Davis Lectures

The tenth Memorial Lecture in Honor of Edward Kremers was delivered at the University of Wisconsin on 17 November 1959 by Dr. Jackson P. English, Assistant Director of Experimental Therapeutics Research at Lederle Laboratories. His subject, "Fifty Years of the Chemotherapy of Infectious Disease," assessed progress since the pioneer work with arsphenamine which was announced by Paul Ehrlich in 1910.

The annual D. J. Davis Memorial Lecture on Medical History will be given on 30 March 1960 in the Dental-Medical-Pharmacy Building of the University of Illinois College of Medicine. Barry J. Anson, Chairman and Robert Laughlin Rea Professor, Department of Anatomy, Northwestern University Medical School, will speak on the subject "Mediaeval Medicine: Pre-Christian Fabric and Present-Day Remnants."

Joshua O. Leibowitz and Suessman Muntner

The young Medical School of the Hebrew University at Jerusalem has given recognition to medical history by granting academic titles to two scholars working in this field. Dr. Joshua O. Leibowitz has been appointed Associate Professor of the History of Medicine, and Dr. Suessmann Muntner has received the title of Visiting Professor. Dr. Muntner is best known for his work on Asaf, the first Hebrew medical writer, and for editing the Hebrew translations of Maimonides' medical works. Dr. Leibowitz, while working principally on Hebrew and Jewish topics, has also contributed investigations on other medico-historical subjects, among them Vesalius, Harvey, and Renaissance medicine. Some of these have been published in this *Journal* and in the *Bulletin of the History of Medicine*. Dr. Leibowitz has held appointments as Visiting Lecturer in the Department of the History of Medicine at Yale (1956) and as Fellow of the Institute of the History of Medicine at Johns Hopkins (1957). His pupil, Dr.

Abraham Reshef, was prize-winner for his doctoral thesis on the History of Diabetes.

F. S. Bodenheimer (1897-1959)

Who could ever forget Frederic Simon Bodenheimer—that tall, noble figure of a savant-courtier, the infinite charm of his presence, the wide range of his creative interest and erudition, his statesmanly wisdom, and above all his rare courage? He steadfastly stood for his convictions and achieved success even in the face of dissentient authority and power. Perhaps it is this courage and simplicity of purpose for which he should be admired in the first place, however easily it may have come to him. For from his earliest days it had been his destiny to be a pioneer. When he was born in June 1897, Theodor Herzl, the visionary founder of Zionism, in a congratulatory letter to his father designated him as the "First Zionist of the Second Generation." Indeed, he devoted his life to the building of the Jewish State, and in this he succeeded through creative work in all branches of zoology and through integration of zoology with scientific humanism. At an early time in his career he found the royal way to humanism of the Sartonian stamp through original studies in the history of biology. This remained his labour of love. His pioneer work in his own country, his cultivation of international cooperation, and the promotion of his subject and its history fully emerge from the narrative in his *A Biologist in Israel* (Jerusalem 1959; reviewed in this issue of the *Journal*). It is a great work—a cross-section of the political and cultural history of our own era, implicitly justifying the existence of our own generation.

A native of Cologne, Bodenheimer studied zoology at Bonn and applied entomology at the School of Horticulture at Geisenheim and at Portici near Naples, meeting on his journey the great Battista Grassi at Rome. After his doctorate in 1921 he joined the Experimental Agricultural Station at Tel Aviv. His chair in the Hebrew University at Jerusalem developed after 1931 from a small research laboratory, as did most of the professorships in science and natural history at that University. Now not only had each of the professors to learn academic Hebrew, but also to create the first modern textbooks in this language. In spite of these duties at his desk Bodenheimer remained attached to field work: expeditions to the Sinai desert, the United States, Hawaii, Ceylon, Turkey (which he explored for three years), Irak, Persia and Finland now predominated the scene of his life. As late as 1956 he embarked on a long expedition to South Africa and Australia—global journeys which at this time implied a grave risk, for his health had been deteriorating for years. Here again his courage would allow nothing to interfere with the program which he had set himself. Indeed, the rich results which he brought home from each of these journeys, including the personal contacts which he had established, seem amply to have justified this attitude toward life. Alas, it is this attitude to which must be ascribed

the grievous loss his family and the multitude of his friends have suffered through his early death at the age of 62.

For several years the writer had the privilege and delight of being visited by Dr. Bodenheimer and his wife whenever they stayed in London, and lately this meant at least once a year. He looked forward to these occasions eagerly because of the happiness which Bodenheimer radiated and imparted—even over the phone—or after a fight with death and devil, doctors, publishers, or agents. In 1957 he recovered from an abdominal operation in London. In 1958, all the time working, lecturing, and travelling from museum to library in many continental towns, he developed somewhat alarming signs. I did not anticipate a visit in 1959—hoping that he would quietly recuperate at home. However, after six months' hard work during the Palestinian summer seeing his 500-page "Auto-Ergographie" through the press, he was seen by John Fulton performing the good offices of an "elder statesman" at the International Congress for the History of Science at Barcelona, joining all parties and excursions down to the Prado, which filled him with delight and happiness. After that he suddenly appeared in London almost as fresh as ever. He came all the way out to Mill Hill by bus as usual, but later in the day he complained about his failing eyesight and the small print in a book, although it was still light and the book was quite well printed. After he had given me one of the first copies of his last work, we parted—reluctantly, though not thinking that it was forever. Before returning home he wanted to see his publishers and had several other appointments for the coming week. Ten days later, however, he died in London after a locally successful eye operation.

WALTER PAGEL

Book Reviews

JOHN B. BLAKE. *Public Health in the Town of Boston, 1630-1822.* Cambridge, Harvard University Press, 1959. x, 278 pp. $6.50.

Reviewed by JAMES H. CASSEDY, *Instructor of History, Williams College, Williamstown, Massachusetts.*

THIS book provides a reliable, straight-forward account of the development of basic public health administration in a new community. Based largely upon original sources, it is probably the first study in depth of this subject for any of the older American cities. It goes far beyond what general histories of public health, such as that of Smillie, have attempted. The author covers environmental sanitation exhaustively, tells the story of yellow fever, and discusses the endemic fevers which were always present.

The book includes a balanced and well-told account of the "earliest important experiment in America in preventive medicine," inoculation against smallpox. Discussing the subject in broader terms than writers such as Beall and Shryock do, the author sets this experiment in the full context of previous sanitary activity, mainly quarantine. He follows it up with a thorough discussion of the "smallpox era," of the emergence of inoculation hospitals, the slow official acceptance of inoculation, and finally, the rapid replacement of inoculation by vaccination. Along the way, the author provides useful summaries of the impact up to 1820 of European epidemiological theories such as those of Sydenham and Pringle, and he describes the evolution of American (Bostonian) medicine generally as it served the public health.

A number of annoying minor flaws mar a generally admirable scholarly work. The smoothness of the narrative, for instance, is blocked by an excessive use of quotations, by the names of an unnecessarily large number of minor Boston citizenry, and by a number of unhappy sentence constructions, of which the awkward sentence that opens Chapter Nine is the most conspicuous. Another criticism is that some of the significant legislative steps in the emergence of public health administration do not receive the stress they deserve but are almost buried. The casual general discussion of the creation of the earliest American boards of health is one instance of this. A pruning of the many repetitious minor sanitary "reforms"—such as the temporary hiring of a man to cart away street dirt—might have helped to throw more important matters into clearer relief.

In a few respects the book might have been somewhat expanded. It would have benefitted from a further discussion of housing, especially for the first few years of settlement and to some extent for other years up to 1800 —it is well covered after 1800. I should have liked to have found greater elaboration on the disinfection practices of these two centuries—these are

only referred to in passing. It would also have been interesting to have had some comment upon whether, as in some other colonial communities, the church registers of Boston were of any value before 1800 as repositories of vital statistics.

Yet, for all of these complaints, the book is satisfying and informative. It is well to be reminded that certain major sanitary projects, such as a public water supply, were under way in some American communities well before the impact of the English sanitary reform movement of the 1830's and 40's. It is illuminating to have further details about sanitary problems and measures during the colonial wars, including the Revolution. It is useful to have the important contributions to vital statistics of Edward Wigglesworth put into the total sanitary context of his times. It is important to have evidence, contrary to previous belief, that environmental sanitation in the 17th century was, after all, undertaken primarily as a health measure rather than for aesthetic reasons. This book will be rewarding both to the general reader and to the medical historian.

WALTER PAGEL. *Paracelsus. An Introduction to Philosophical Medicine in the Era of the Renaissance.* Basel—New York, S. Karger, 1958. xii, 368 pp., 36 figs. Sfr. 70.

Reviewed by FRANCISCO GUERRA, *Research Associate, Department of the History of Medicine, Yale University School of Medicine.*

EVER since his lifetime, the ideas and works of Paracelsus [1494-1541] have been the object of violent controversy. His revolt against the classics, neglect of anatomy and physiology—subjects in which he had little interest and less knowledge—and, on the other hand, his apparent return to alchemy and his reliance on chemical doctrines as the mechanisms of disease and therapy assumed enormous significance in medical science during the Renaissance. The extent to which the iatro-chemistry of Paracelsus may be said to account for the development of chemotherapy, or to what extent his observations on the miners' lung, the connection which he saw between goitre and intake of minerals in water, or the suggestion of the diuretic action of mercury, as well as other topics found in his writings, can be claimed to be the origin of modern medical thought still remains the object of much speculation.

However, Pagel's study of Paracelsus does not attempt primarily to offer an appraisal of accomplishments, nor does it provide a biographical background to his works. The author's aim is rather to explain the origin of Paracelsus' medical theories in the light of the doctrines, ideas, and philosophy of his time. This being the fundamental aim in mind, this work departs from the usual treatment of the subject and abandons the approach usually found in biographies or studies of Paracelsus, which tend to treat him rather as a mediaeval legend. Dr. Pagel does not dwell on biographical detail; only the bare facts of Paracelsus' life are given in order to clarify the background of the man. A similar attitude is adopted by the author with regard to the

notes on the bibliography of Paracelsus, which would be justified only in extensive Paracelsiana. After these preliminary chapters, Pagel embarks upon a most careful analysis of Paracelsus' philosophy, first presenting his religious approach to Nature, which was somewhat Pantheistic and rather closer to the tenets of the Anabaptists than to any other group of the Reformation, but it should always be borne in mind that Paracelsus invariably valued the book of Nature more highly than the Bible. On the basis of this fundamental belief it is easy to understand the confidence he placed in knowledge acquired through experience, as opposed to the logical method of Aristotle, and how this divergent opinion tended increasingly to alter the attitude towards the medical classics.

Pagel's work cannot be skimmed through; every topic has to be studied with care. In particular, the discussion of Paracelsus' philosophy has to be absorbed painstakingly, because Paracelsus tends to express himself in parabolic terms, and in philosophical dissertations he employs an obscure lexicon, using diverse and unusual values which can be fully understood only by the initiate. Confusion may all too easily arise from the misinterpretation of 'scientia's virtue' present in natural objects, the use of 'magic' to express a specific action, or the apparent contradiction between the action of a drug said to be independent of astral influence, with, at the same time, a correspondence between the 'astrum' and the seat of the disease. Current terminology of the present day also handicaps the reader's understanding of the elements in terms of Paracelsus' three principles: sulphur, salt, and mercury. As a result, Paracelsus' neologisms render interpretation so intensely complicated that a point is reached when the use of such words as 'archeus,' 'iliaster,' 'monad,' 'cagastrum,' and so on, more than justified his nickname of Cacophrastus.

The medical theories of Paracelsus, as presented by Pagel who annotates them step by step in the most scholarly tradition, are easier to understand as regards the origin, localisation, and therapy of diseases. As Pagel points out, Paracelsus' philosophy of disease, which proved so successful in discrediting the use of sudorifics, emetics, and the practice of blood-letting, had at its source his conception of an analogy between man and his outer world. His belief in specific therapeutic measures, that is the use of an exogenous substance capable of combining with an equivalent material within the body, pinpoints the idea of the etiological value of therapy, as opposed to the classic theory of using measures to evacuate morbid humours in a general way. This specificity of disease and remedy was present in Paracelsus' search for remedies through the study of the cosmos. One of the most interesting fields for speculation in Pagel's study is to be found in the chapter devoted to an explanation of the Paracelsean doctrine of specificity in the connection between the organ as the seat of the disease, the disease itself, and its remedy; also discussed is the difference between the Galenic polypharmacy and Paracelsus' search to simplify the composition of ingredients by separation until the quintessence is obtained, the concept—still current in pharmacological

activity—of the potentially poisonous characteristic of a remedy, the basis of Paracelsus' doctrine of signatures, and the reasons he gave to support the homeopathic principle. Several other chapters are devoted to a summary of the pathological ideas of Paracelsus as emanating from the concept of tartar, to throwing new light on his forecast of the chemical basis of epilepsy, and to a discussion of the influence of Ficino upon his ideas about plague.

However, it is in the study devoted to the sources of Paracelsus that Pagel finds an accurate technique for the completion of his treatise. This is to consider and compare Erastus' censure of Paracelsus and Sennert's defence, that the ideas they attacked and defended may be the better understood and appraised. By quoting from each of these authors in succession, Pagel gives the arguments put forward by Thomas Liebler, called Erastus [1523-1583], in opposition to Paracelsus' views on creation, attacking him as a restorer of gnostic heresy, believer in miracles and the powers of the imagination, and refuting his theory of the mechanism of contagion and ideas advanced on diseases. The same treatment is given to the work of Daniel Sennert [1572-1637], with more particular reference to the microcosm theory, the sympathy and antipathy of natural objects, the theory of a prime matter, and ideas relating to generation and pathology.

Pagel's final assessment of Paracelsus is presented by a discussion as to whether he was in the modern sense a scientist and originator of ideas. Consideration is given to the possible effect of his absence from the historical scene and to the pattern of his message and knowledge. Pagel provides the hard facts in answer to all queried aspects, and scattered throughout the text are more than a thousand notes in which he supports his findings, but never does he conceal the fact that in all probability the most important single outcome of Paracelsus' work was the way it proved to be of inspiration to another man—J. B. Van Helmont [1579-1644], about whom Dr. Walter Pagel will no doubt soon publish another work.

LLOYD G. STEVENSON. *The Meaning of Poison* (7th Series of the Logan Clendening Lectures on the History of and Philosophy of Medicine). Lawrence, The University of Kansas Press, 1959, 53 pp. $2.00.

Reviewed by CHAUNCEY D. LEAKE, *Dean, School of Medicine, Ohio State University, Columbus.*

WRITING in his usual clear and witty style, Dean Stevenson deals in his lectures with two aspects of the meaning of the word "poison": poison as a pathogen in a broad sense, and poison as a tool of research in physiology and pharmacology. The first lecture treats of poison, infection, and contagion, and it traces historically the development of the medical concepts associated with these words. Even the notion of sepsis was associated with the notion of poison and, as late as Paracelsus, decay was still identified with poison.

Specific poisonous materials were early classified on the basis of origin, some from animals like snake venom, some from minerals like arsenic, some

from vegetables like opium. Both acute and chronic poisoning were greatly feared in classic and medieval times, but curiously metallic poisons were little used in antiquity. Many unusual aspects of poisoning are discussed by Dr. Stevenson, such as the legends of the poisoned damsel and poisoned letters. The many fascinating aspects of antidotes to poisons are only incidentally mentioned.

The second lecture, "Hellish Oorali," gives the story of curare. This delightful essay opens with an account of the scientific interests of Alfred Lord Tennyson and his reaction to the hard-headed French scientists such as Magendie and his pupil, Claude Bernard. Tennyson's dislike culminated in a diatribe against French medicine in the bad poem, "In the Children's Hospital" published in 1880. There occurs the line "Drench'd with the hellish oorali."

Dr. Stevenson shows that the first writings on the New World contained references to arrow poisons. While these early accounts indicated that the arrow poisons were made by old hags, the fact is that women are carefully excluded from the actual preparation of curare. This is part of the wide notion that women have a deleterious influence on masculine magical rites, extending, as Dr. Stevenson says, even to fishermen and politicians in the 20th century. The early accounts regarding curare emphasize its extreme poisonous character as well as the extreme range of variation in spelling the word denoting the material. It was Alexander Humboldt who first accurately described the preparation of curare and it was Richard C. Gill who succeeded, only a few years ago, in finally identifying the actual botanical species used for making it.

Stevenson describes the early experimental studies with curare leading to the important and clear analysis of the mechanism of its action as reported by Bernard in 1864. As the author indicates, it is now quite appropriate that the horror felt as late as the 19th century for hellish oorali should be changed so thoroughly to appreciation of its value, especially as an adjunct in anesthesia to relax taut muscles, a use introduced by Harold Griffith of Montreal in 1942. The most extensive study of curare was made by A. R. McIntyre in 1947. Through the study of curare has come most of what is known concerning neuromuscular transmission. From the remote jungles, through scientific laboratories, curare has reached the operating rooms of the 20th century. Dr. Stevenson concludes, "Though Lord Tennyson was horrified, mankind in general has reason to be glad."

One wishes that these delightful essays could have been somewhat expanded, to develop more fully the theme and point of view so skillfully proposed. However, the very function of the Logan Clendening Lectures is to provoke interest, excite the imagination, and stimulate further study and investigation. *The Meaning of Poison* admirably fulfills this function. It is well documented and indexed.

THOMAS N. BONNER. *The Kansas Doctor. A Century of Pioneering.* Lawrence, University of Kansas Press, 1959. 334 pp., 36 illus. $5.00.

Reviewed by EDWARD H. HASHINGER, *Clinical Professor of Medicine Emeritus, University of Kansas School of Medicine, Kansas City.*

THE publication of regional histories of medicine will ultimately result in the writing of a much desired definitive history of medicine in the United States. Following closely the publication of Professor Duffy's "The Rudolph Matas History of Medicine in Louisiana," this volume presents with outstanding excellence the story of medicine in another state.

The author, Thomas Neville Bonner, Professor of History at the University of Omaha, served as a Fulbright lecturer in American Civilization at the University of Mainz in 1954-55, and in 1959 received a Guggenheim Fellowship to finish his study of the impact of German universities upon American medical men in the 19th century. He is the author of *Medicine in Chicago* and has contributed to periodicals articles on medical history and Civil War historiography.

He who selected the motto of Kansas—*ad astra per aspera*—was certainly unknowingly prophetic of the history of medicine in that fair state. Published on the one-hundredth anniversary of the State Medical Society, this is a story of the Kansas doctor—his achievements and failures, his hopes and frustrations, his deeds and misdeeds.

There is no philosophical free-wheeling in this volume, as one finds all too frequently in "histories" when facts are wanting, for, utilizing 285 books, manuscripts, newspapers, etc., including 33 county histories, for a total reference of 430 items, the author has given us a delightful, easily read, intriguing story of medicine in "bleeding Kansas."

Among the pioneers who endured the hardships of early settlement of Kansas were many physicians. In several instances their claim to fame came from other sources than successful practice of medicine. For example, Dr. Charles Robinson, a free-stater from Massachusetts, who chose Lawrence as the place of settlement for the Antislavery New England Emigrant Aid Society, was actively engaged in politics. He was the first governor of the state, and his lieutenant-governor was Dr. Joseph Root, and the secretary of state, Dr. John W. Robinson. The slavery-antislavery conflict waxed strongest in Kansas in those years with John Brown of Osawatomie (famous or infamous—suit yourself) fanning the flames, some of which scorched a few early physicians of political bent.

Not all of the early physicians were men of culture or with formal education, and many of them engaged in other enterprises, being politicians, farmers, druggists, patent medicine manufacturers, preachers, teachers, editors, postmasters, merchant, poets (one wrote "Home on the Range") in addition to following the healing art.

With horses and saddle bags these physicians (statistics of 1878 showing a minority of them with M.D. degrees) rode great distances in their prac-

tice, ringing the "doctor's bell" on arrival in a community, and with strength, patience, good humor, and courage survived until the surge of people came with the railroads, and their burdens were somewhat eased by concentration of population.

This early medicine consisted much of bleeding, purging, and emetics, 8 grains of calomel being considered a conservative dose. But there were some excellently trained physicians among the pioneers, such as the father of the medical profession of Wichita, Dr. Andy Fabrique, a graduate in medicine from Tulane, who subsequently studied under Christian Fenger and Nicholas Senn. Dr. Odell of Miami County reported in 1869 the healing of a compound fracture without incident after using carbolic acid as an antiseptic. Dr. Charles C. Furley, of Wichita, said in 1878 "if micrococci are not present it cannot be true diphtheria," and Dr. C. C. Green urged sterilization of milk in 1889. Dr. T. S. Floyd in 1880 said "cleanliness is more essential than antiseptics in surgery."

Yes, these were the days of laudable pus, chloroform anesthesia, whiskey for tranquility, pesthouses, dysentery, "ague," and cholera. There were quacks, patent medicines, homeopaths, and eclectics. In the environment of feuding physicians, Mrs. Winslow's Soothing Syrup which contained morphine, and "tonics" usually 50 to 60 per cent alcohol—the delight of the dear ones who followed the banner of Carrie Nation—Kansas grew.

Three months after Roentgen's announcement of the X-ray, Professor Blake of the University of Kansas physics department, was using it. Medical advances through laws were changing the picture in Kansas. The Kansas Medical Society had been formed at Lawrence in 1859 to war against quacks and empirics. A medical practice act was passed by the state legislature in 1867. Legislation in health matters developed. Dr. Schenck in 1878, speaking before the state medical society in urging medical responsibility for state hygiene, said: "We are to see that laws are executed prohibiting murder by smallpox, cholera, scarlet fever and like diseases. We believe the life and development of the men and women of the State are as important to its interests and to humanity, as the life and development of its hogs and potatoes, and we believe they are capable of expansion and prolongation, and we should ask, we should demand, that the State of Kansas shall manifest an equal interest in them, and that its legislators shall enact a law organizing a State board of health, giving it full power to protect the interests under its care." Within seven years Kansas had a board of health, a stronger medical practice bill, and a law regulating the drug trade.

While Dr. T. L. McCarty was treating the gunshot wounds in Dodge City inflicted by Bat Masterson and Wyatt Earp, at Lawrence—the Athens of Kansas—a gentle lady, Dr. Francesia Porter, became the first woman in history to be admitted to a medical society.

When in 1904 Dr. Samuel J. Crumbine was selected as secretary of the board of health, health in Kansas took a leap upward. Consistently supported by William Allen White in his *Emporia Gazette*, Crumbine cam-

paigned, evangelized, fought, lawed, and schemed with remarkable success, to become the real father of public health in these United States. He "swatted the fly," killed the rats, abolished the public drinking cup and roller towel, cleaned out the stock yards, caused the enactment of pure food laws, and squeezed morphine and alcohol out of patent medicines. He established the world's first minimum standard for oysters on the dry plains of Kansas, and was the first to establish a division of child hygiene. If Kansas can lay claim to a great man in medicine, it is Crumbine.

There were proprietary medical schools, if one could offer them that distinction, until the establishment of the University of Kansas Medical School in 1899, under Dean Samuel W. Williston who had as his assistant Dr. Clarence E. McClung, and Dr. Marshall Barber who as early as 1896 was giving a course in bacteriology. Truly a great trio. Grave robbing was rampant until a law (1897) provided the use of unclaimed bodies for anatomical dissection.

As Crumbine brought better health to Kansas, so did the University of Kansas School of Medicine, through many ups and downs, finally advance the quality of physicians and medical practice in the state, with faculties that included in the "renaissance" period such men as Mervin T. Sudler, Roswell Wahl, Ralph H. Major, T. Grover Orr, Logan Clendening, and Geo. E. Coghill.

In the final setting of health in Kansas there appear the famous Menninger brothers with their stimulus for mental health, aided and abetted by Dr. Franklin Murphy, now Chancellor of the University but at that time Dean of the Medical School. Oh, there have been great doctors in Kansas, but there have been quacks and charlatans, not the least of which was Dr. John Brinkley of goat-gland-rejuvenation fame who, to the dying shame of the citizenry of Kansas, almost was elected their governor. Then there was Dr. Arthur E. Hertzler, the "Horse and Buggy Doctor" of Halstead, a great scientist, scholar, surgeon, writer, and humanitarian.

All through the maze of Carrie Nation, John Brown, the Populists, and Dr. Brinkley the medical men of Kansas have shone brightly in their profession, and proved trustworthy in their citizenry. And Mr. Bonner tells you this in a fascinating way in a volume on the history of medicine of classical value.

F. S. Bodenhelmer. *A Biologist in Israel.* Jerusalem, Biological Studies, Publisher, 1959. 492 pp. 45 plates and 99 text illus.

Reviewed by Walter Pagel, M.D., *Consultant Pathologist, Clare Hall Hospital, nr. Barnet, Herts, England.*

Every chapter of this magnificent book can claim the acute interest of the historian. Only the last hundred pages are devoted to the author's activities in the history of biology—including a complete bibliography of his numerous publications. The bulk of the work is a vivid demonstration of how the history of science was *made,* not only by the author himself, but by a whole

generation—his masters in entomology, his colleagues all over the world, and above all the heroic team of scientific pioneers who successfully combated insect pests in Palestine against heavy odds under his leadership. These adverse conditions are perhaps best illustrated by the press-photograph of the author as a supernumerary policeman in 1936 and the three captions given: "A typical native member of the Palestine police force" (a London newspaper)—"A Professor must be a soldier in Palestine" (an American comment)—"One of the Jewish brigands who attack the Arabs in Palestine" (Fascist journal published in Libya 1942). The rich harvest of scientific facts and progress which has resulted from Bodenheimer's labours on behalf of agricultural bodies and governments throughout the Middle East is revealed against autobiographical background that makes delightful reading and takes us without tears into the centre of intricate problems of animal life, ecology, and entomology. In this respect Part III, on Agricultural Entomology, qualifies as the most substantial part of the book—with its chapters on agricultural pests in general, on Citrus Entomology, and on the problems connected with the appearance of locusts and voles. Naturally the historical aspects of these problems are given careful attention. This particularly applies to the study of insect-borne Manna in the Sinai desert and to subsequent chapters on the Israel Fauna and on Insects as Human Food.

Bodenheimer is the author of such important historical works as: *Materialien zur Geschichte der Entomologie bis Linné.* 2 vols. (Berlin, 1928-29), *Timotheus of Gaza On Animals* (with A. Rabinowitz: Leiden, 1949), *Rabbi Gershon ben Shlomo d'Arles: The Gate of Heaven* (London, 1953) and *History of Biology. An Introduction* (London, 1958). He tells us how these works grew from an early appreciation of Aldrovandi and of the significance of Aristotle in modern biology and throughout its history. He was thus able to show that Aristotle is the real founder of animal ecology, for as he judiciously adds: "It is always erroneous to regard the modern background of principles and problems as the measure of achievement in the history of science." "Animals in Bible Lands" and the "History of Biology in the Middle East" form the main topic of his historical chapters. These notably include the archeological evidence, and here the pioneer work of such of Bodenheimer's predecessors as Fred Hasselquist (1722-1757) and H. B. Tristram (1822-1906) are given due attention and prominence. The subject most interesting to the historian of medicine is the *Seeker of Truth* by Shemtow Falaquera who lived in Catalonia and the South of France in the thirteenth century. In it we accompany a young mediaeval and oriental Faustus on his visits to the exponents of contemporary arts and sciences with whom he discusses their daily activities. The visit to the physician dealing with outpatients and on his rounds is particularly well elaborated. A translation of this poetical encyclopedia of mediaeval knowledge is among the many works which we can still expect from the pen of the author.* In addi-

* This hope cannot be realized unfortunately since Dr. Bodenheimer died on 4 October 1959.

tion to all this the delightful account of Bodenheimer's experiences as President of the International Academy of the History of Science and the VIIth International Congress of the History of Science in Jerusalem must be mentioned.

The surest way in which the historian of science can gain mature wisdom is through creative work in science. This is amply shown in the present account of Bodenheimer's achievements. His historical insight and wisdom are particularly well reflected in his concluding remarks on the change in scientific ideas and the spiritual climate that makes discovery possible. "The description of a milestone does not imply comprehension of a period. . . . We to-day realise that we have failed to explain the most essential factors of spiritual change, the defeat or conquest of ideas. If we have made any progress it is merely that we are now aware of our total ignorance . . . or the essence of change . . ." (p. 459).

ERWIN H. ACKERKNECHT. *A Short History of Psychiatry.* Translated by Sulammith Wolff. New York, London, Hafner Publishing Company, 1959. vi, 98 pp.; 9 plates. $3.50.

Reviewed by RICHARD A. HUNTER, *Psychiatric Registrar, National Hospital for Nervous Diseases, London.*

THE original German edition of this book (Stuttgart, Enke, 1957) has already been extensively reviewed by G. Mora (this *Journal,* 1959, *14,* 113-116). This English version reads fluently and to it have been added nine plates and an index. The opportunity has also been taken of correcting some of the misprints which marred its otherwise generally accurate and acceptable, if condensed and therefore limited, presentation of the history of psychiatry. Every working psychiatrist now has the chance to obtain at least a nodding acquaintance with the history of his specialty and the great who have made it what it is today.

R. R. SIMPSON. *Shakespeare and Medicine.* Edinburgh and London, E. & S. Livingstone Ltd.; Baltimore, Williams and Wilkins, Co., 1959. viii, 267 pp. 25s.

Reviewed by KENNETH D. KEELE, *Consultant Physician to the Ashford and Staines Hospitals, Middlesex, England.*

THIS book sets out with a fourfold objective of recording the medical references in Shakespeare's plays and poems; of assessing Shakespeare's knowledge of medicine and doctors; of considering the uses to which Shakespeare put this knowledge; and of discussing the sources of his medical references. A similar though perhaps not so exhaustive survey was carried out by Dr. Bucknill in 1860 and since then there has been much sporadic writing, but no comprehensive survey made.

The 712 medical references which the author found in Shakespeare's plays and poems promise ample evidence for the other objectives, particu-

larly so since he has chosen the interesting method of comparing Shakespeare's references with those of his contemporary playwrights such as Christopher Marlow, Ben Jonson, and John Webster. The main point which seems to emerge from these comparisons is that medical references are extremely common amongst all the Elizabethan playwrights. In fact Marlowe's knowledge of medicine seems to be deeper than Shakespeare's.

Since the author addresses the book to "his medical colleagues," they would have been interested to find some reference to Shakespeare's knowledge of anatomy and physiology, but such a section has been omitted apparently in the interest of general readers. Shakespeare's anatomical references are in fact rather scanty and singularly inferior to those of Homer, who lived long before Galen and Vesalius. Shakespeare's knowledge of physiology and of clinical medicine, both as regards diagnosis and treatment, is only that of many other non-medical people of his day. True it is that he makes magnificent use of such knowledge as he possessed, but there is no evidence that he had any special anatomical, physiological or clinical training.

The curiously strong determination on the part of many protagonists of Shakespeare to show that he must have known of the circulation of the blood has had to be explored once more by the author, with a negative result. There is no evidence that Harvey knew Shakespeare personally at all or that his knowledge of the circulation of the blood had been arrived at before Shakespeare's death in 1616. On the other hand, as regards the matter of jaundice, Mr. Simpson himself is not aware how modern Shakespeare's view is. To "creep into the jaundice by being peevish" is still an aetiology of jaundice held by those devoted to the psychosomatic study of medicine—the "mechanism" being by spasm of the sphincter of Oddi through emotional changes and nervous impulses down the vagus; both animal and human experiment offer some support to this view. With Mr. Simpson's special appreciation of otolaryngology it is surprising that he has not referred to the recent suggestion that Julius Caesar's "falling sickness" was probably Menière's disease rather than an epileptiform fit, particularly in view of Shakespeare's reference to unilateral deafness.

This brings one to perhaps the chief gap in this book; one feels it would have been improved by more interpretation. The chapter on the medical aspects of Romeo and Juliet consists almost entirely of a bare record of medical references. This does not apply to the essay on Shakespeare and the influence of his son-in-law, Mr. J. Hall, Physician. It appears that Shakespeare's respect for physicians coincided with his acquaintance with his son-in-law John Hall. In his high opinion of physicians, Shakespeare seems to stand alone amongst Elizabethan playwrights.

This book is beautifully produced but it is marred by frequent misprints such as "vague terminals" and "artera aspera." The index is inadequate for those purposes of reference which constitute the real usefulness of a book of this kind.

GOTTFRIED KOLLER. *Das Leben des Biologen Johannes Müller, 1801-1858.* Stuttgart, Wissenschaftliche Verlagsgesellschaft M. B. H., 1958. 268 pp.

Reviewed by NICHOLAS A. HALASZ, *Assistant Resident in Surgery, Yale University Medical Center.*

JOHANNES Müller was known as a physiologist in his day. However, his interests and researches ranged far afield from this sphere as it is known today, and included pathology, histology, comparative anatomy, and embryology. He lived in an era of rapid development in these sciences. Thus, Humboldt, Henle, Retzius, Meckel, and Virchow were not only his contemporaries but his friends as well. The environment was one of free give and take, and scientific correspondence amongst scholars was popular. Fortunately, therefore, much can still be learned from letters exchanged, informal progress reports, and written discussions.

Born a cobbler's son, Müller showed his brilliance early. With the aid of scholarships he completed his formal education at the age of 21 at the Medical School of Bonn and won a prize for his thesis about fetal respiration that same year. After some years spent in Berlin in research he was appointed assistant professor at Bonn when 25 years old. During his tenure he ranged over a variety of fields. The function of glands occupied his interest for some time. He made the first clear distinction between the glands of internal and external secretion. Studies in the embryology of the genitourinary tract followed, including an analysis of the genesis of hypospadias. Müller was probably the first to use the frog widely as an experimental animal, taking advantage of its easy availability and sturdiness. At the age of 29 he became Professor of Anatomy and Physiology in Berlin, a position he was to hold for the rest of his life. His great capacity for work allowed him to teach 12 to 14 hours a week in addition to carrying on his research. He also became editor of a journal hitherto Meckel's; much of his work was published in it, and it became known as Müller's Archiv. During his early days in Berlin he travelled to the sea for the first time. Marine biology excited his interest profoundly, and this interest lasted for many years. His travels also took him to museums throughout Europe, including a long trip to England with Henle, one of his students.

Müller's *magnum opus,* the *Handbook of Physiology,* first appeared in 1833. Its first volume had gone into several editions and was widely read before Volume II appeared in 1837. The work is a peculiar mixture, when read today. It abounds in teleological interpretations in fields where knowledge was incomplete. However, observations and established facts are evaluated with cool objectivity and acutely critical thinking. The work was highly successful in spite of the fact that the printing and illustrations were of rather poor quality, Müller having chosen as publisher his brother-in-law, to whom he had felt indebted.

Studies of phonation and the functions of the larynx were the last major undertakings in physiology. Thereafter Müller concentrated more and more

on comparative anatomy. A detailed study of chordates occupied him for some years. He first realized the significance of the notochord as a forerunner of the vertebral column and its later incorporation into the vertebral centra. Classification of the echynoderms took him on many travels along the Baltic Sea, trawling for larvae. The first analyses of plankton composition were those of Müller's, although they were only a sideproduct of his lifelong search for specimens.

The Revolution of 1848 threw a tremendous load on his shoulders as Dean of the Medical School. Trying to protect the student body from extremism and pacifying both sides put Müller into a profound depression. This was the third such episode and is thought to have been the manifestation of a manic-depressive personality. He regained his mental equilibrium after a year and resumed his oceanographic studies. His name had spread over all of Europe and honors were heaped on him by many countries. However, his work remained uppermost in importance to him along with his family and a few close friends, such as Retzius and Humboldt. His students were many, and a genealogy of his followers occupies pages. Haeckel is the best known of these.

Müller was basically a collector and a systematizer. His library of over 4,800 items, his museum and the extended travels in search of specimens all attest to this. His major accomplishment was the organization of lower animal life-forms into a philogenetic system—a work of Linnean magnitude. Rudolphi, his teacher, and Müller were instrumental in terminating the philosophical approach to biology and laying the groundwork for the objectively descriptive and analytical science it became in the late 19th century.

The book strikes a happy balance between a personal and a scientific biography. Of necessity it cannot be both at once. However, by the use of quotations from his many letters to the family and to professional friends Müller's personality as well as scientific philosophy become clearly evident. The gradual change from being a theist to the pragmatic natural philosopher of his late days is understandingly traced. Numerous illustrations from original publications accompany the text.

This volume is more than a biography of this great biologist. It also ably sketches the atmosphere of intense scientific curiosity and the development of the analytical approach in the mid-19th century from which much of our present-day biological knowledge stems.

FRANCIS C. HABER. *The Age of the World, Moses to Darwin.* Baltimore, The Johns Hopkins Press, 1959. xi, 303 pp. $5.00.

Reviewed by LEONARD G. WILSON, *Visiting Assistant Professor, Department of History, Cornell University, Ithaca, New York.*

THE Biblical interpretation of history, so prevalent in the period from 1600 to 1900 and still very much alive among the Fundamentalist sects of Chris-

tianity, is a topic of perennial interest because, for those of us who were once taken to Sunday School, it represents the framework of the world as we knew it in early childhood, and which our education in school and university has piece by piece dismantled to leave us in the lonely vastness of infinite space and time. The revolution in man's view of himself and the world brought about by geology and biology in the last two centuries is both a great triumph and a great tragedy—the triumph of an emerging science, the tragedy of a disintegrating religious world view closely connected with fundamental values. As a result we have the somewhat schizophrenic mentality of modern man.

In this study of the problem of the age of the world Professor Haber has told more fully the story of the retreat of theology than that of the advance of science. This is perhaps less true in his account of the 17th century's discussions of fossils than in his treatment of later periods, but I think it is a fair estimate of his general approach. One sees the successive retreats of the theologians, their makeshift reconciliations between geology and the Bible, the collaboration of devout scientists in such reconciliation, the failure of the scientists themselves to save the Bible and in the end, the total collapse. What one does not find in Professor Haber's book is much account of the geology and biology itself which is bringing about such great changes. This raises the question as to how advisable it is to write on a subject so intimately involved in the history of science while leaving out the science.

In discussing the work of Nicolaus Steno, Professor Haber writes on page 51:

> After gaining a reputation in Paris as a physician Steno went to Florence in 1665 and received an appointment as Physician to Grand Duke Ferdinand II. He was also admitted to the brilliant company of scientists at the Accademia del Cimento, and it is probably through this influence that his attention was drawn to the problem of fossils.

This statement is unobjectionable except that we know more precisely how Steno's views developed. When in 1666, an extraordinarily large shark was caught in the Mediterranean off Livorno, Ferdinand II, Grand Duke of Tuscany had its head brought to Florence in order that Steno might study it. As a result of his dissection of the shark's head Steno made a detailed comparison of the shark's teeth with the *glossopetrae* or "tongue stones" which some people said had once been sharks' teeth. Steno confirmed this view and arrived cautiously at the general conclusion that fossils which resemble parts of animals may be assumed to have really been once the parts of animals. This conclusion required that the strata of Tuscany, which contained *glossopetrae,* had originally been laid down under the sea. If Steno arrived closer to geological truth than any man before him, as he certainly did, it was because he reasoned carefully from detailed observations. When Professor Haber discusses Steno's geological theories without entering into the scientific basis of them the reader may well be left with the impression that

his ideas were merely the brilliant speculations of an imaginative mind, and that their resemblance to modern theories is only a remarkable coincidence.

Professor Haber's description of the development of the uniformitarian views of Charles Lyell is similarly brief and unencumbered with scientific detail. His discussion of the development of Lyell's views occupies less than two pages (pp. 215-16). After referring to Lyell's review of the *Geology of Central France* by George Poulett Scrope, in which Lyell outlines for the first time his own uniformitarian views, Professor Haber states:

> Subsequent geological tours in France, Italy and Great Britain convinced Lyell that uniformitarianism was irrefutable and he brought his arguments together in the next few years, laying the foundations for his *Principles of Geology*. (p. 216)

The basis for the most crucial revolution in geological thought is thus dismissed! We are not told what Lyell saw in his geological tours nor what he concluded from what he saw. Yet Lyell's *Principles of Geology* omitting the results of his tour in France with Murchison in 1828 and those of his own independent continuation of this tour to the south of Italy would be like Newton's *Principia* without its mathematics.

When Lyell rode southward through Italy in 1828 he expected to find on the basis of his uniformitarian presuppositions that the tertiary strata of Italy would grow younger as he moved towards the areas of modern volcanic activity around Vesuvius and Aetna, because, in uniformitarian theory, these ought to be the areas of most recent uplift. Lyell's criterion by which to decide what rocks were more recent than others was the proportion of the fossil shells in the rock which were of species identical with modern species living in the adjacent waters of the Mediterranean. What he found magnificently confirmed his theory. On 9 November 1828 he wrote from Naples to his sister Eleanor:

> My expedition to Ischia was of use to me here for as I procured three times as many fossils in three days as they had ever got from the Isle, they regard me as a good workman. Costa, an ex professor of Otranto, has named them all, so let the box go to the bottom, or the shells be annihilated by Douaniers, *I will let the world know that the whole Isle of Isk, as the natives call it, has risen from the sea 2,600 feet since the Mediterranean was peopled with the very species of shell-fish which have now the honour of living with, or being eaten by us*—our common oyster and cockle among the rest. [Lyell, *Life and Letters*, v. 1, p. 213—italics mine.]

The triumph of uniformitarianism over catastrophism was not because of the greater logic of its ideas or the greater brilliance of their presentation, but because of the great body of geological observation which Charles Lyell brought forward in support of his ideas. The question was ultimately decided not in the meeting rooms of London, but by the geological travels of Lyell, which in Europe ranged from Sicily to Sweden and in North America, from Nova Scotia to New Orleans, and by Charles Darwin's

traverses over the plains of Patagonia and the high benches of the Andes. It would be difficult, however, to infer this from Professor Haber's book.

The omission of the scientific background to the theologico-scientific struggle actually makes the upholders of traditional views seem more dogmatic and unreasonable than they were, for it suggests that they refused to admit what was obvious and sensible. Nothing is obvious in science until it has been made so. In the absence of geological fact and carefully attested theory the traditional account of the seven days of Creation and of the Flood was no more improbable than other speculations and it carried with it the authority of Scripture.

On the other hand, and again I think because of his lack of emphasis on scientific developments, Professor Haber gives a too favourable account of Abraham Gottlob Werner. He connects Werner with the philosophy of empiricism and says of Werner's school:

> Their primary concern was with the constitution of the earth's crust as it is, not as it was, and their pragmatic approach coincided neatly with the doctrinaire philosophy of empiricism. (p. 160)

Further on he says:

> After his appointment to the Freiburg Mining Academy in 1775, Werner became the central figure in geology, raising it to a recognized science, and instilling in a generation of his students excellent observational techniques. (*Ibid.*)

Werner's observational techniques were, however, limited entirely to the characters of minerals. As a mineralogist Werner was a considerable pioneer, but as a geologist he was the wildest speculator who never admitted that his views were merely speculations. Geological facts, as opposed to mineralogical facts, he simply ignored. It was for this reason that he failed completely to understand volcanic geology. In contrast James Hutton's theory of the earth established criteria for working out the history of volcanic formations and especially of volcanic intrusions into sedimentary strata. Of the two opposing theories, the Neptunist and Vulcanist, it was the Vulcanist which was derived from, and supported by, an immense number of geological observations, and which was the more empirical.

Yet, when the qualifications occasioned by the sketchy treatment of science in this book have been made, it must be said that this is an excellent short book on the historical problem of the age of the earth. Professor Haber weaves together an account of the views of philosophers, theologians, and some scientists in a comprehensive survey extending roughly to 1900. His fullest discussion is given to the eighteenth and early nineteenth centuries and in this period he presents fresh points of view and introduces writers whose ideas are not readily to be found discussed elsewhere. The book is fully annotated and has an index, but no bibliography.

HUGH BARBER. *The Rewards of Medicine.* London, H. K. Lewis, 1959. 140 pp.

Reviewed by EDWIN CLARKE, *Assistant Scientific Secretary, The Wellcome Trust, 52 Queen Anne Street, London W. 1, England.*

THE author, a retired physician of Derbyshire Royal Infirmary, has gathered together thirteen essays contributed to the *Practitioner* or *Guy's Hospital Gazette* during the past ten years; to them he has added two hitherto unpublished.

Although there is evidence of a wide contact with history and literature throughout, only six essays deal with specifically historical topics. The others are on subjects as diversified as positive health, dying, psychosomatic disease, old age, and favourite prescriptions. One, on *The Value of Fiction in Medical Education,* is particularly valuable and could well be published in other medical school journals so as to reach a wider student audience. Dr. Barber makes excellent use of the wisdom acquired from many years of dealing with patients and people and he presents it in an attractive, yet simple form.

The historical items deal with eponyms, water cures, body snatching, Smollett, Jane Austen, and Erasmus Darwin. Jane Austen must be one of the author's favourite writers, for she is mentioned in several places, and his essay on her medical wisdom shows close study of her works.

There is little new here for the medical historian, but the younger members of the profession and students will find much of interest. Dr. Barber's writings show him to be a thoughtful and cultured physician—the type of person needed more and more in medical education as medicine becomes increasingly technical.

G. CANBY ROBINSON. *Adventures in Medical Education. A Personal Narrative of the Great Advance of American Medicine.* Cambridge, Massachusetts, Published for The Commonwealth Fund by Harvard University Press, 1957. xii, 338 pp., illus. $5.00.

Reviewed by FRED B. ROGERS, *Temple University School of Medicine, Philadelphia, Pennsylvania.*

IN this interesting book, Dr. G. Canby Robinson, a senior statesman of American medicine, reviews major developments in medical education in which he played a leading role. Based on a long and varied experience in medical teaching and administration, his account is readable and significant and will appeal to both health professionals and laymen. Though moving in and out of the pages, and frequently occupying the center of the stage, the author does so with grace and objectivity. There is much more than a personal narrative in these pages which offer a synopsis of the evolution of American medical education in an informal style. Medical educators, in particular, should not fail to read this volume.

A native of Baltimore, Robinson entered the Johns Hopkins Medical School in 1899, six years after it opened, when that school, and a few others, were spearheading a reform in medical education and practice. Receiving his M.D. degree in 1903, he served briefly as a surgical assistant at a sanitarium in the Finger Lakes district of New York and as a teacher of anatomy at Cornell University before interning at the Pennsylvania Hospital in Philadelphia. Service as assistant pathologist under Dr. Warfield Longcope for two and one-half years was then followed by two years of rotating clinical experience as resident physician. One year in Europe, spent chiefly in the clinic of Dr. Friedrich von Müller at Munich, completed a thorough clinical training.

A short period of private practice in Philadelphia ended in September 1910 when Dr. Robinson accepted the post of senior resident physician at the Hospital of the Rockefeller Institute for Medical Research, which received its first patients soon after his arrival. As administrative assistant to the director Dr. Rufus Cole, Robinson was responsible for the general care of patients and the organization and direction of the medical service. It was during this interval that Abraham Flexner's inflammatory reports on the status of American medical schools made their initial impact.

In 1913 Dr. Robinson moved to the Washington University Medical School in St. Louis—at the time of its reorganization and expansion. Seven years later, in 1920, he was appointed dean of the Vanderbilt University School of Medicine; here also he directed sweeping progress in organization, teaching, and research. Moving again in 1928, he became director of the New York Hospital-Cornell Medical College Association in New York City which was undergoing reorganization at that time. Difficulties related to the economic depression and clumsy administrative structure of a dual organization led to his retirement from the directorship in 1934.

Appointed next to a visiting professorship in medicine at the Peiping Union Medical College in China, he travelled widely during a respite from administrative chores. Upon returning to the United States, Dr. Robinson became a pioneer in exploring the social and emotional aspects of illness at the Johns Hopkins Hospital. Shortly before World War II the American Red Cross selected him to direct its Blood Donor Service—a position he occupied with distinction for five years. Having then reached the retirement age at Johns Hopkins, he accepted a post as executive secretary of the Maryland Tuberculosis Association, holding this office until 1955, when he began writing the present book.

True to his book title, Dr. Robinson gives scant attention to his own early life, beginning with his admission to medical school. From that point on, his account is studded with the names of the great and near great of medicine with whom he had contact in a career which took him about the United States, to Europe, and the Orient. The discouragements and differences of opinion met during his long career are dealt with gently by the author. His kindly spirit and vast erudition grace this octogenarian's record

of achievement. All readers interested in the evolution of medical teaching in the United States and in the activities of one of the best-known medical figures of our century will find this a rewarding book.

JOHN R. YOUNG. *An Experimental Inquiry into the Principles of Nutrition and the Digestive Process.* With an introductory essay by William C. Rose. Urbana, University of Illinois Press, 1959. xxvi, 48 pp. $2.50.

Reviewed by OWEN H. WANGENSTEEN, *Professor of Surgery, University of Minnesota, The Medical School, Minneapolis.*

THIS is the first in a series of "Facsimile reprints in the history of science, sponsored by The History of Science Society of the University of Illinois." In the preface Dr. W. C. Rose pays high tribute to the brilliant work of a young American, John R. Young, to whom he attaches the worthy title of the "First American Biochemist." Young's paper, dated 8 June 1803, was submitted as a thesis to the Trustees and the Professors of the University of Pennsylvania in partial satisfaction of the degree of Doctor of Medicine when the candidate was not yet 21 years of age. He dedicated this thesis to his father, Dr. Samuel Young, who practised in Hagerstown, Maryland, and to one of his teachers, Dr. Benjamin Smith Barton, the Professor of Materia Medica, Botany, and Natural History in the University of Pennsylvania.

In reviewing the significant work of Young, it is probably not out of place to indicate that, around the turn of the century, a number of candidates for the M.D. degree at Pennsylvania fulfilled their requirement for a thesis by writing on the subject of digestion. Of these theses, that of John R. Young is easily the best, the most imaginative and original in design for garnering evidence of the digestive power of gastric juice. Young had opened the stomachs of frogs and snakes and noted the effect of the gastric juice upon the contents of the stomach. In opening one large bullfrog, to his great surprise he noted that the stomach contained a small spring frog, of which partial digestion had laid the bones bare. In addition, the larger frog's stomach contained another small frog, the hind quarters of which were found in an advanced state of digestion, the muscles having been reduced to a jelly. In another frog's stomach, a field mouse was encountered in an advanced state of digestion.

These observations set the stage for Young's well-conceived plan of assessing the digestive power of the gastric juice. He found that when he placed a small spring frog in the same container with a large bull frog that the latter cannibalized the former. In judging the nature of gastric juice, Young came to the conclusion that its acid was phosphoric. A number of distinguished persons, Claude Bernard and Barreswill (1844), also concluded erroneously that the acid in the stomach was phosphoric.

Young's theory of gastric digestion is at variance with modern thought upon the subject in one other respect. John Hunter (1772) proposed the idea of the "living principle" as being responsible for the circumstance that

the stomach failed to digest itself. On a suggestion from Pringle, Hunter pursued the effect of cerebral trauma upon gastric digestion and observed that when the bodies of patients who died of head injuries lay uninterred for several hours, not infrequently they presented at autopsy evidences of digestion along the greater curvature or actual perforation of the stomach. In fact, Hunter suggested that if one could insert the living hand of a man into a dog's stomach, it would resist digestion, a thesis which Claude Bernard (1856) proved definitely to be wrong, when he inserted the hind quarters of a frog through a gastrostomy wound into the lumen of a dog's stomach.

In his experiment testing the thesis of the "living principle" Young tied a string to the leg of a living frog; it was extricated in five minutes and it leaped away. The experiment was repeated and the frog was left down eight minutes. It again was withdrawn and was quite alive, though unable to leap. When swallowed for a third time, on extrication fifteen minutes later, the small frog was dead. Young concluded that the prolonged interval of submersion killed the frog, following which the gastric juice was able to digest it.

An experiment upon the outcome of which Young reposed a good deal of confidence in the "living principle theory" is set forth in the following. He tied two threads around the forelegs of a live small spring frog. The whole body save for the head and forelegs was introduced into the gullet of a large frog. The forelegs of the little frog were clasped around the lower jaw of the larger frog and were firmly tied in this position, making it impossible for the larger frog to swallow completely the smaller one. Young then placed the larger frog containing the smaller one into a basin of water. After a day and a half, the frog was pulled out and though covered with "gastric juice" was not the least injured in any way. The same frog when killed and again introduced into the stomach of the large one, in the very same position, when pulled out five hours later was completely dissolved, affording *clear proof* of the "living principle," Young says. This reviewer would infer that the little frog being very much alive had been able to pull its hind quarters well up into the gullet of the larger frog and in consequence, was able to escape continual submersion in gastric juice. Young then divided the sciatic nerve of an extremity of a living frog and introduced it into the stomach of a larger frog in order to determine whether the "living principle" resistance factor had been weakened by the division of the sciatic nerve. The small frog remained in the "stomach" of the larger frog for a period of twelve hours; when pulled out, it was quite alive and the denervated extremity was quite sound and undamaged. Unless this extremity too lay in the esophagus, the observation, which was only a single one, would be very difficult to understand.

The design of Young's experiments was truly remarkable, and his book deserves a high place in the history of gastric digestion, being entitled to stand beside the pioneer labors of Réaumur, Spallanzani, and Hunter with whose writings on digestion he was familiar. It is strange that his work

should not have been known to Beaumont or to his contemporaries with whom Beaumont communicated freely. It is most appropriate, therefore, that the University of Illinois Press, under the leadership of its distinguished biochemist William C. Rose has reprinted this extraordinary and long forgotten thesis of a distinguished early American biochemist whose life was cut off by tuberculosis less than a year after his graduation. With Dr. Rose's delightful and informative preface, the book will serve to give this remarkable essay of a most extraordinary young medical scientist the attention and long overdue recognition it so justly deserves.

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Charles Poyen Brings Mesmerism to America*

ERIC T. CARLSON**

FRANZ Anton Mesmer first evidenced the direction of his future interests and career in November 1765 when he submitted his thesis, "The Influence of Planets on the Human Body," for his medical degree,[1] but he did not begin to practise what we now call mesmerism or hypnotism until the year 1774. By 1778, however, his activities were so suspect in Vienna that he was forced to leave for Paris, where his practices again placed him in the center of controversy and led Louis XVI to request in March 1784 that the Academy of Sciences appoint a commission to examine the questionable validity of animal magnetism. Among the distinguished men appointed to serve on this committee were Jean Sylvain Bailly, Antoine Lavoisier, and Benjamin Franklin. After considerable investigation they issued an unfavorable report which was published in Paris in the same year[2] and in London in 1785.[3]

Despite the condemnatory nature of this report, interest in animal magnetism was sustained in France during the ensuing decades. Although Mesmer had left the country shortly after the critical report appeared, some of his students continued their studies. In later years, moreover, the Marquis de Puységur, who also worked with the apparent phenomenon of clairvoyance, demonstrated that a crisis was not necessary, that somnambulism could be substituted for it. Alexandre Bertrand lectured on mesmerism in the 1820's, emphasizing the importance of studying the patient and the influence of suggestion. Finally, in 1826, a new investigation of magnetism was initiated, resulting in 1831 in a report more favorable than that of 1784. About the same time Richard Chenevix interested the British in the subject to some degree, although it was only after hearing the views of J. Dupotet in 1837 that John Elliotson began his controversial career in this field of endeavor, to be fol-

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1 Goldsmith, M. *Franz Anton Mesmer: The history of an idea.* London, Arthur Barker, 1934. 282 pp.

2 *Rapport des commissaires chargés par le Roi de l'examen du magnétisme animal.* Paris, Imprimerie Royale, 1784. 66 pp.

3 *Report of Dr. Benjamin Franklin and other commissioners, charged by the King of France with the examination of the animal magnetism.* London, J. Johnson, 1785. 108 pp.

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lowed in a few years by James Braid and James Esdaile. The Americans first manifested their interest in yet another form of suggestive therapy when Elisha Perkins introduced his metallic tractors in 1796. Later, in 1829, they had the opportunity to hear Joseph Du Commun lecture on animal magnetism in New York City.[4]

Almost fifty years after the original publication of the unfavorable report in France an American edition and translation of that report first appeared.[5] Investigation into the intriguing question as to why the 1784 report should have been republished at such a late date reveals that in the United States at that time there was a flurry of interest in mesmerism caused by the proselyting efforts of a French visitor, Charles Poyen.

We know nothing about Poyen's birth and early life. He was pursuing his medical studies in Paris in 1832 when he developed a complicated nervous illness which largely affected his stomach and the right side of his body.[6] After eight months of fruitless medical therapy he turned in desperation to a Dr. Chapelain. Chapelain employed a woman who supposedly had a clairvoyant insight into illness when in a somnambulistic state. He magnetized her and Poyen was amazed to hear her, a complete stranger, give a minute and accurate description of all his symptoms. She predicted that his disease would be most difficult to cure and that it would probably be several years before he recovered. This, his first experience with mesmerism, led to his total conviction of its validity and importance.

In a further attempt to regain his health, Poyen sailed in 1833 for a sugar plantation owned by his relatives in the French West Indies. During the 14 months of his visit he had the opportunity to see the plantation owners mesmerize several of the colored servants. His health had shown little improvement, however, and so he decided to visit the United States to see if another change of climate would benefit him. In late 1834 he landed at Portland, Maine, and proceeded to Haverhill, Massachusetts, where lived a paternal uncle who had immigrated to the United States at the time of the French Revolution. After a visit of five months, Poyen moved to the town of Lowell with the intention of there improving his Eng-

[4] Du Commun, Joseph. *Three lectures on animal magnetism.* New York, Joseph Desnoues, 1829. 78 pp.

[5] *Report of Benjamin Franklin and other commissioners charged by the King of France with the examination of the animal magnetism as practiced at Paris.* Philadelphia, H. Perkins, 1837. 58 pp.

[6] The main source of biographical information has been Charles Poyen's *Progress of animal magnetism in New England.* Boston, Weeks, Jordan & Co., 1837. 212 pp.

lish by teaching French and drawing. As he had become increasingly fond of the American people and their customs, he decided to remain permanently in this country and to contribute whatever he could of value to it. Two essays represented his initial attempt in this direction. The first was entitled, "Comparative Utility of the Study of the Ancient and Modern Languages for Promoting the Spirit of Christianity and of Peaceful Association Among Nations,"[7] and the second, "Philosophical and Historical Essay on Slavery, Followed by the Exposition of a New System of Measures for the Civilization of Africa and the Abolition of Slavery in the United States."[8] In the latter he reiterated the antagonism towards slavery which he had first experienced in the West Indies.

One day late in 1835 Poyen learned in a discussion with Dr. Elisha Bartlett,[9] the mayor of Lowell, that although the mayor himself had read a slight amount regarding animal magnetism, the subject appeared to be essentially unknown in the United States. He resolved to rectify this general ignorance, beginning by translating a memoir by Dr. L. L. Rostan, but soon found that he could not interest any of the Boston publishers in this venture. He then decided that he would attempt personally to stimulate an interest in the subject by delivering a course of public lectures and so returned to Lowell to write four speeches which were to be given at Chauncey Hall in Boston.

Poyen had good reason to expect that the people of Boston would be receptive to his ideas, ideas intended to increase man's knowledge of himself and to better his lot in life, because in that city the movement to reform and improve the condition of man was at its height. The reform movement appeared in many guises: in the altered debtor laws, the generally improved penal system, the newly founded public institution for the treatment of the mentally ill at Worcester and the schools for the blind and deaf, as well as in the campaigns against intemperance and slavery, and the early struggle for recognition of women's rights. Three years

7 A long extract of this paper appeared in the *Ladies Magazine* of April-May, 1836.

8 Part of this appeared in the *Theological and Literary Review* in the summer of 1837.

9 Elisha Bartlett (1804-1855) had received his medical degree from Brown in 1826 and then had spent one year in Paris, where he undoubtedly learned about mesmerism. He served as a teacher in over a half-dozen American medical schools, ranging from Vermont to Kentucky. In 1831 he translated J. L. H. Peisse's *Sketches of the activity and writing of eminent living physicians and surgeons of Paris.* His book on fevers was first published in 1842 and subsequently went through three more editions. Sir William Osler *(Elisha Bartlett, a Rhode Island philosopher.* Providence, 1900) has pointed out his role as a philosopher of medicine and called Bartlett's *An essay on the philosophy of medicine,* published in 1844, a classic in American medical literature.

earlier, moreover, J. G. Spurzheim had aroused a wave of enthusiasm for phrenology as the exact science of man.[10]

At the same time, however, much of the local populace was skeptical of the value of some or all of these new concepts, and when Poyen began lecturing in January 1836,[11] his efforts were scornfully received by the local press, with predictions that no one would possibly be interested. He then decided that experimental demonstrations would be more stimulating and instructive but felt himself incapable of mesmerizing subjects because of the precarious nature of his health. He therefore proposed to teach others the technique of animal magnetism. He was promptly accused of doing so for his personal gain, which charge he denied since he taught many without fee, even though some of his pupils suggested that he keep his techniques secret and charge for his instruction. He strongly believed that animal magnetism was a branch of natural science and, being such, should be widely disseminated for the public good and the inspiration of further scientific research. All the evidence points to his honesty and good faith, although he was frequently accused of being a charlatan milking the pocketbooks of a gullible public.

His first publication on the subject of mesmerism was in the issue of 10 February 1836 of the *Boston Medical and Surgical Journal*,[12] which was to publish a number of notices and comments about his activities over the next two years. His lectures were a summary of the French literature, with nothing original added. He had completed his first course of lectures and begun a second by late February.[13] Early in March he was circulating a prospectus for a translation of the French Academy of Medicine's 1831 investigation of mesmerism.[14] This investigation, conducted by the Commission of the Royal Academy of Medicine, extended over a period of four years, 1827-1831, and resulted in an official report much more favorable than the one issued 47 years previously.[15] In June 1836 this translation materialized as Poyen's first published book.[16]

10 For a discussion of the influence of phrenology on such diverse matters as education, health, architecture, penology, literature, and religion, see: John D. Davies, *Phrenology, fad and science*. New Haven, Yale University Press, 1955. 203 pp.

11 *Boston med. surg. J.*, 1836, *13*, 418-419.

12 *Ibid.*, 1836, *14*, 8-12.

13 *Ibid.*, 1836, *14*, 36.

14 *Ibid.*, 1836, *14*, 83.

15 *Report of the magnetical experiments made by the Commission of the Royal Academy of Paris, read on the meetings of June 21 and 28, 1831, by Mr. Husson, the reporter*. Translated from the French, and preceded with an introduction by Charles Poyen, St. Sauveur. Boston, D. K. Hitchcock, 1836. 172 pp.

16 *Boston med. surg. J.*, 1836, *41*, 322.

The volume began with an introduction in which Poyen praised mesmerism for illustrating the divine origin of man, for opening a new field to psychological speculation and investigation, and for introducing a new form of therapy. After pleading for tolerance in investigating mesmerism, he went on to define the subject and explain the technique. He thought that the phenomena were caused by a magnetic fluid which was of the same nature as electric fluid (electricity) and denied that imagination could play more than a small role in producing these phenomena. He completed his introduction with a brief history of mesmerism. Shortly after the publication of this book he wrote an article reporting further investigations in France[17] and another pleading that the evidence in his work be taken seriously.[18]

At the same time that Poyen was working on this translation, one of his students, Thomas L. Nichols,[19] published his own attempts at mesmerism; his achievements included reducing Poyen's own digestive pain and bringing sleep to an hysterical woman who supposedly had not slept for six months.[20] By mid-March, Nichols was giving lectures on the subject.[21] Poyen had also succeeded in inducing a fellow French teacher, Monsieur B. F. Bugard, to practise mesmerism on various subjects, including Poyen.[22] Bugard was the hypnotist in what was probably the first case of hypnotic anaesthesia in the United States when on 28 June 1836 a tooth was pulled from a 12-year-old girl without any evident pain.[23]

In August 1836, Poyen went to Bangor, Maine,[24,25] where, for the first time, he did not lose money on his lectures. One member of his Maine audience to be fired with enthusiasm by what he heard was Phineas Parkhurst Quimby, who long afterwards practised mesmerism and won fame for his treatment in 1862 of Mary Baker

17 *Ibid.*, 1836, *14*, 365-366.
18 *Ibid.*, 1836, *14*, 382-384.
19 Thomas Low Nichols (1815-1901) was to have a varied life. He studied medicine at Dartmouth but shortly before receiving his degree he left for a career in journalism at Lowell. In 1837 he became the editor of the *Buffalonian*, during which time he was jailed for libel. He was an advocate of the dietetic practices of Sylvester Graham and the social theories of Fourier, Josiah Warren, and J. H. Noyes. After marrying Dr. Mary S. Gove in 1848 he returned to medical school and obtained his degree in 1850. For a while he and his wife ran a water cure school in New York, but then left for Cincinnati in 1855, where he became converted to Catholicism. Being opposed to the Civil War, he emigrated to England, where he remained for the rest of his life. There he continued his hydropathic school and wrote widely about diet and health. When he died in France at the age of 85, he was known as a great pioneer of food reform.
20 Nichols, T. L. *Boston med. surg. J.*, 1836, *14*, 56-57.
21 *Ibid.*, 1836, *14*, 84.
22 *Ibid.*, 1836, *14*, 141-145.
23 West, B. H., *ibid.*, 1836, *14*, 349.
24 *Ibid.*, 1836, *15*, 50.
25 *Ibid.*, 1836, *15*, 205-206.

Eddy, the founder of Christian Science. Quimby also fused his interest in animal magnetism with his theological inclinations.[26]

By September, Poyen was greatly discouraged by the general indifference to his lecturing and by the expenses which were depleting his financial reserves. He seriously considered sailing back to the West Indies, but his animus against slavery and his desire to vindicate his faith in mesmerism finally prevented his leaving the country. Instead he decided to accept the often-repeated invitation of a Dr. Niles Manchester of Pawtucket, Rhode Island, to visit that state, little suspecting that this move would improve his prospects markedly.

Dr. Manchester had been most anxious that Poyen treat a patient of his, a Miss Cynthia Ann Gleason, who had suffered for over ten years from stomach disturbances that interfered with her eating and sleeping. She did not respond to Poyen's first hypnotic attempt on 5 November, but he successfully magnetized her on his second trial. This performance was repeated on numerous occasions during his two-month stay in Providence and resulted in a definite improvement in her health. She felt grateful to Poyen for assisting her and consented to take part in public demonstrations at Brown University. Poyen realized that here at last was the possible solution to his problem. With a good magnetic subject he could hope to create the general interest that he desired, and with demonstrations he could overcome the doubts of the skeptics. He still felt that his nervous system was so weakened that he could not hope to magnetize any great number of new subjects. He invited Miss Gleason to go to Boston with him and she readily accepted, since she had begun to feel that it was her duty to prove that the effects of mesmerism were not only actual but also beneficial. Both of them were severely censured for this move, most frequently being accused of faking the effects through collusion and doing so for their own personal gain.

On their arrival in Boston in January 1837 they gave a private demonstration to a select group of the leading physicians and literati of the city.[27] A second performance was given at the request of faculty members of the Harvard Medical School, and this demonstration was followed shortly thereafter by public lectures. In these lectures Poyen would come out on the stage to make preliminary remarks about his work. He was a well formed but slender man of

[26] Podmore, Frank. *Mesmerism and christian science.* Philadelphia, G. W. Jacobs and Co., 1909. 306 pp.

[27] *Boston med. surg. J.*, 1837, *15*, 403.

medium height whose face was nearly half covered by a dark red birthmark.[28] He appeared grave, thoughtful, and studious. He has been described as appearing relaxed and confident, but has himself indicated otherwise. He would apologize in a handsome manner for his difficulty in speaking English with any accuracy. His accent required his audience to pay strict attention in order to follow the intricate theme of his lectures. Poyen would start with a short but complete sketch of the history of animal magnetism. He presented this sketch in such an honest and unostentatious manner that he generally created a feeling of trust and confidence in many of the people in his audience. He would then illustrate the operation of magnetism by mesmerizing his subject, Miss Gleason, either by speaking suggestively to her or by standing silently behind her. He would demonstrate her insensibility by exposing her to sudden loud noises, by pinching her, and by forcing up her eyelids. Further demonstrations included causing an apparent paralysis of her arm by simply pointing at it, giving certain directions which she then would follow, and blindfolding her and bringing a magnet towards her hand, which would then move upwards towards the magnet. The most spectacular part of her performance was that characterized as the phenomenon of clairvoyance. Poyen would have her comment particularly on the health and symptoms of the various people who volunteered. Her accuracy gave her a considerable reputation for being able to diagnose patients she had never seen. She would also do simple experiments such as attempting to recognize objects while blindfolded.

The *Boston Medical and Surgical Journal* reported that something astonishing had occurred in Poyen's demonstrations, but its request that one of the witnesses submit a full account of the particulars was ignored.[29] The local press was much more inclined to criticize than to praise, suggesting that the entire demonstration represented charlatanism. Poyen had invited the press to attend and was deeply wounded when they attacked him without even having witnessed his performance. Again ridicule and accusations of collusion for personal gain prevailed. A later writer complained of the "proneness of the American people to ape foreigners, in manners, customs, doctrines, fashions and evil practices. . . . France is aped the most. . . . If the principle urged by the votaries of animal magnetism are true what are we to expect of it? Why, nothing less than a great reformation in the moral, political, medical and social

[28] *Ibid.*, 1844, *31*, 167.
[29] *Ibid.*, 1837, *15*, 403.

world; also a mighty revolution in arts, sciences, and literature. A glorious era has just begun."[30] These criticisms made Poyen extremely sensitive about his honor and reputation, so much so that he grew increasingly weak, anxious, and irritable. He found it difficult to perform his experiments and began to fear occasional failures. He then hit upon the idea of using a third person in his demonstrations, a volunteer from the audience. This practice would prove that there was no collusion and at the same time conserve his weakened system.

Although Poyen received his greatest criticism in Boston, he found pleasant success during his travels with Miss Gleason over the next six months. After being in Boston through most of February 1837, he returned to Providence and then to Lowell, Massachusetts, in March. In April and May he delivered a series of lectures at Nashua, New Hampshire, and gave further demonstrations during the summer at Taunton, New Bedford, and Nantucket. The record of the lecture tour comes to an end at this point, and it appears that Poyen took to the pen again, since he contributed generously to the flurry of publications which appeared in the fall of 1837.

In September he proposed to found a bulletin of animal magnetism in the United States, to be entitled *Psychodinamist* and published in 16 pages semi-monthly at a cost of $2 per annum.[31] There is no evidence that this proposal ever came to fruition. It is possible that the *Boston Medical and Surgical Journal* made a typographical error and that it should have been *Psychodynamist*. In any event, here was an early precursor of a word that was to become a favorite of our age. The *New English Dictionary* lists the first use of this word by G. H. Lewes in 1874, while D. Hack Tuke's *A Dictionary of Psychological Medicine* of 1892 does not contain this term.

Early in September Dr. Thomas C. Hartshorn of Providence started the flood of publications on mesmerism with Part One of his translation of J. P. F. Deleuze's *Practical Instruction in Animal Magnetism*, which was first published in Paris in 1825.[32] A second and third part followed in November and December and because of the book's favorable reception and wide influence, four more editions appeared up to 1884.

Providence seems to have been a principal contributor to the interest in mesmerism in America, for, in addition to Miss Gleason,

30 *Ibid.*, 1838, *17*, 395-398.
31 *Ibid.*, 1837, *17*, 131.
32 *Ibid.*, 1837, *13*, 113-114. The original edition was published by B. Cranston and Company in Providence, Rhode Island.

it added Loraine Brackett and Mrs. Andros to the ranks of magnetic subjects. Miss Brackett, who had lost her powers of sight and speech after a blow on the head, had been a student of Dr. Samuel G. Howe before she came under the care of Dr. George Capron of Providence. By mesmerizing her, Capron was able to restore her voice and partial vision as well. She soon obtained such a wide reputation for her alleged clairvoyance that Colonel William L. Stone[33] from New York was invited to test her during the month of August. She so impressed him with her ability to describe unseen pictures, to read from a sealed statement, and to describe his home in New York that, with the encouragement of Dr. Amariah Brigham, one of the leading pioneer psychiatrists in this country,[34] he put his report into print. This pamphlet proved to be so popular that the first edition of 2,000 copies was soon exhausted and two more editions were necessary.

C. F. Durant[35] had been experimenting on his own in August, but he did not publish his *Exposition* until October.[36] In this 200-page volume, whose underlying satire masked by flowery language makes it enjoyable reading, he set up a series of concepts that gave an initial impression of fervent belief in animal magnetism. By applying these hypotheses experimentally, however, he concluded by totally refuting the evidence for animal magnetism as such. His tools and dupes in this refutation were Mr. and Mrs. Andros. Mr. Andros had found that his wife was a good hypnotic subject and had made plans to demonstrate his ability in New York City. Durant, by enlisting their belief in his bogus theory, was able to disprove a number of points about magnetism. He demonstrated that Mrs. Andros could see nonexistent houses, that she picked up cues both visually and aurally, and that other people besides the magnetizer could suggest ideas to her. He also demonstrated clearly, without realizing it, the power of counter-suggestion. Durant unfortunately drew the wrong conclusions from the right

[33] William Leete Stone (1792-1844) was the editor and owner of a number of newspapers after 1813. He had fought for Greek independence and the Erie Canal, and was pro-Mason. Although advocating the emancipation of slaves, he was opposed to the campaign for women's rights. In the last year of his life he was superintendent of common schools in New York City.

[34] Stone, W. L. *Letter to Dr. A. Brigham on animal magnetism.* New York, George Dearborn and Co., 1837. 75 pp.

[35] Charles Ferson Durant (1805-1873) was one of America's early aeronauts. He made two balloon ascents in Paris in 1829 and became the first native to ascend in the United States, making approximately 13 trips. He tried to interest the United States in balloons as a means of travel but apparently abandoned this interest after his marriage in 1837. Thereafter he turned to printing and lithographing, politics, and the study of seaweed.

[36] Durant, C. F. *Exposition; or, a new theory of animal magnetism.* New York, Wiley and Putnam, 1837. 225 pp.

evidence. He decided that Mr. Andros was a sincere person who had been deceived by his wife. He felt that Mrs. Andros faked all the effects, picked up available cues, and in a completely alert state purposefully strove to achieve the desired conclusions. Actually, Durant had proven very cleverly that no magnetic fluid existed, but had failed to see that he had demonstrated that the effects of hypnotism depend upon suggestion and imagination. Durant again raised the old accusation that the main purpose was financial gain, a suspicion which probably was valid in the case of Mr. and Mrs. Andros.

Poyen countered his critics with two publications in October. In the first, a pamphlet answering Stone and Durant, he agreed with Stone that seeing at a distance or clairvoyance was probably not possible.[37] He felt that the effects were obtained by thought transmission to the somnambulist. He therefore condemned Stone for not demonstrating the power of the will in the phenomena that he described. Poyen believed that this transmission of thoughts was a natural gift and that the phenomena occurred in what he called "a high state of lucidity." He dealt more vigorously but less successfully with Durant's publication by generally condemning it. He emphasized that success depended on the confidence of the magnetizer and that excess anxiety destroyed the results, thereby implying that Durant's hostile influence had made serious experimentation impossible. He now called imagination a genuine magnetic force, but still insisted on the existence of some other emanation as well.

Poyen's last publication is a monument to his attempts to further the cause of animal magnetism.[38] It is a book reporting the progress of this concept in New England. In it he gives abundant evidence for the validity of animal magnetism, describes how he became interested in the subject, and records the history of his and other people's efforts to develop and prove its truths. He points out that 18 months earlier no one was especially interested in the subject and that at the present time he personally knows 40 people who have actively used hypnosis in one fashion or another.

By this time interest in mesmerism had not only reached New York, but had also progressed to that seat of culture in America, Philadelphia. From there came two publications in that month of October 1837, one favorable and one not. The latter was the pre-

[37] Poyen, C. *A letter to Col. Wm. L. Stone of New York . . . and a plain refutation of Durant's exposition. . . .* Boston, Weeks, Jordan, and Co., 1837. 72 pp.

[38] See footnote 6.

viously mentioned translation of the original report of Dr. Franklin and the other committee members some 60 years before.[39] This report in itself was moderately condemnatory, finding no evidence for any magnetic fluid and dismissing the effects as being caused by imagination and excitement. Again these effects in themselves were not considered worthy of further investigation. The unknown editor of this volume concluded with a brief review of the activity in this country—which he considers unfavorably—and leaves a warning heard many times since: that women should be particularly careful of this procedure because gross indecencies had been committed.

The favorable volume was entitled *The Philosophy of Animal Magnetism* by a "gentleman of Philadelphia" who has since been tentatively identified as Edgar Allan Poe.[40] Poe's biographers have pointed out his interest in the scientific movements current in America at that time, movements which included both mesmerism and phrenology. In this his favorable volume he admitted that clairvoyance stood as the main obstacle to acceptance of hypnotism. He was favorably inclined towards Stone's pamphlet although he attacked Durant's book. He discussed the various theories behind the functioning of the nerves and magnetism, proposing that, rather than being anti-religious, mesmerism actually proved the existence of a soul since it supposedly established a connecting link between physiology and psychology. That Poe was interested in hypnotism at a later point in his career is established by the following: a case study reported in "A Tale of the Rugged Mountains" in *Godey's Magazine*, April, 1844; a metaphysical discussion between the narrator and a mesmerized subject who dies while in the trance in "Mesmeric Revelation" in the *Columbian Magazine*, August, 1844; and the prolongation of a dying man's life by hypnotism in "The Facts in the Case of M. Valdemar" in the *American Whig Review*, December, 1845.

[39] See footnote 5.

[40] (Poe, E. A.) *The philosophy of animal magnetism.* By a gentleman of Philadelphia. Philadelphia, Merrihew and Gunn, 1837. 84 pp. Joseph Jackson was able to locate only three copies of the original edition and therefore had a reprint edition of 105 copies made in 1928. On the basis of internal evidence in the book, and from the facts of Poe's life, he concluded that this work came from Poe's pen. This theory has not been generally accepted, however. John W. Robertson *(Bibliography of the writings of Edgar Allan Poe,* San Francisco, Russian Hill Private Press, 1934. 2 vols. 231 and 310 pp.) does not mention the work. Charles F. Heartman and James R. Canny *(A bibliography of the first printings of the writings of Edgar Allan Poe,* Hattiesburg, Miss., The Book Farm, 1943. 294 pp.) list this volume as having been deposited at the Library of Congress on 3 November 1837, and they point out that this work is disputed and is not discussed by A. H. Quinn *(Edgar Allan Poe,* New York, 1941). Sidney E. Lind in his article "Poe and mesmerism" *(PMLA,* 1947. *62,* 1077-1094) also does not mention this pamphlet.

The initial wave of enthusiasm for animal magnetism seems to have come to an end by 1838. In November 1837 the venerable *American Journal of Medical Sciences* published a short condemnatory note.[41] In the following month the *Boston Medical and Surgical Journal* referred to Poyen as: "That indefatigable man, who is perseverance personified, . . . whom we most heartily wish had devoted himself with equal zeal to some other course of study."[42] Except for one or two brief allusions to the subject, the pages of this journal are devoid of any further consideration of that topic which had previously occupied so much of its editorial interest. The silence regarding animal magnetism seems to have spread to the entire American scene. An interest in the subject would revive only when phrenology and mesmerism were fused into the new concept of phreno-magnetism, championed after 1841 by such diverse people as Joseph R. Buchanan, Robert H. Collyer, H. H. Sherwood, and LaRoy Sunderland. Thereafter, general interest in hypnotism appears to rise again and may be seen in the medical literature, in lay publications, in novels, and later in faith healing movements.

Little is known about the remainder of Poyen's life. It is presumed that he left the United States in 1838 or 1839; we next learn that in 1841 he was in Paris diligently pursuing his medical studies in the hospitals there.[43] Poyen had not lost his interest in the United States and had made arrangements in the summer of 1844 to return, but died at Bordeaux on the point of embarkation. The *Boston Medical and Surgical Journal* wrote his medical epitaph as follows: "Having sown the seed, . . . a mighty host of animal magnetism sprung up in a trice; they swarmed throughout the length and breadth of the northern states, like locusts; but having used up the resources of their silly admirers, and devoured the green leaves of vulgar popularity, they gradually died away, one after another and have now become, in vulgar parlance, the laughingstock of every common-sense community."[44] History reveals this as unduly harsh criticism of a man who sincerely advocated the study of a phenomenon of human behavior which since has led to increased understanding of the dynamics of the human personality.

41 *Amer. J. med. Sci.*, 1837, *21*, 268-274.
42 *Boston med. surg. J.*, 1837, *17*, 303-305.
43 *Ibid.*, 1841, *24*, 414.
44 *Ibid.*, 1844, *31*, 166-167.

Ballistics and the Instrumentation of Physiology: The Velocity of the Projectile and of the Nerve Impulse*

H. E. HOFF** and L. A. GEDDES**

A PRIMARY attribute of inventiveness, if not of genius itself, is the ability to recognize the broader applicability of concepts developed by other sciences and to adapt them as tools for new purposes; these fruitful insights must be thought of as an important ingredient of advance in science. Here recounted is a chain of events linking ballistics and neurophysiology and culminating in one of the latter's most important experiments, the measurement of the velocity of the nerve impulse.

"Ballistics was, after navigation, the most obvious example of the application of mathematics to utilitarian purposes."[1] It grew from diverse contributions: the lore of practical gunners who, like Nelson, strove "to get so close to our enemies that our shot cannot miss their mark";[1] the calculations of the gunnery experts of the Renaissance (to whom shooting at long ranges was the flower of the art requiring a nicety of weighing and measuring, and that supreme mystery, the elevation of the cannon to strike targets beyond the point-blank range), and the fundamental theory of scientists like Galileo and Newton who saw in the recoil of the piece and the flight of the projectile the working of natural laws of mass and motion. Indeed, ballistics was not unlike medicine in the heterogeneity of its practitioners and devotees and in the importance, if not the direction, of its impact on society. Each specialty had its great fundamental discoveries, and each had its unit of measurement; trajectory might well be equated with circulation, while velocity of the projectile in ballistics and of nerve transmission in medicine were the fundamental measurements. It is perhaps not surprising that the two determinations were linked one with another, but this is so little recognized that it might be of interest to place the events in their natural juxtaposition and present in chronological order the sequence of events that led in 1850 to Helmholtz's discovery of the finite velocity of the nerve impulse.

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ROBERT HOOKE AND THE VELOCITY OF BULLETS

It is by no means unexpected in the light of recent reappraisal of the status of Robert Hooke[2] to find him involved in this problem, largely through the interest of an effervescent Royal Society, from whose minutes Gunther[3] reports that on 24 August 1664,

> There was made an experiment for finding the velocity of a bullet by means of the instrument for measuring the time of falling bodies; which was so contrived, that the pendulum was set on moving by the bullet's passing out of the mouth of the carabin, and a board was put up for a mark at a determinate distance, and a string extended from that board to the pendulum, which was fixed just by the gun. It was thought, that by means of that string, which was stretched pretty stiff, and so contrived, that a small thrust against the board would stop the pendulum, the impulse of the bullet against that board would be presently communicated back to the pendulum, by which means that vibrating body being stopped at the very instant, would have shown the time, that the bullet was passing from the mouth of the piece to the board or mark. But it was found upon several trials, that the bullet pierced through the board, which was three inches thick, and did not break a small slender piece of white thread, which was to have stopped the pendulum.[3]

A letter to Boyle, written by Hooke only the next day, reports the experiment in much the same terms, and makes it clear that Boyle, away on a trip in the west of England, had not participated in it. Mentioning first the experiment of suspending a pendulum from the steeple of St. Paul's and timing its excursions, Hooke continued:

> We yesterday made several odd experiments about the velocity and strength of a bullet shot out of a carbine, whereof some circumstances will certainly seem very odd: one of which was, that the bullet pierced through a board three inches thick, and yet broke not a very small weak piece of white thread, that held that barred against the force of the bullet: a second was, that though two of these small threads were tied across the nose of the piece, so as one would have thought it impossible, that the powder should have been discharged without breaking those threads; yet, notwithstanding, both the powder and the bullet were discharged out of it, without doing the thread any other harm, than only a little singing it, which made me a little reflect upon the strange effects I had observed in thunder and lightning.[3]

Two final notices give all that is known of the fate of these experiments. On 17 September 1664, "It was ordered that Dr. Charleton and Mr. Hooke meet the Saturday following in the afternoon, to try the velocity of a bullet shot out of a gun." On the 5th of October of the same year, "Dr. Charleton and Mr. Hooke reported of the experiment, which they had made of the velocity of a bullet, shot out of a musket, that, as near as they could observe,

the bullet being discharged with Prince Rupert's powder, went above six score yards in half a second. It was ordered to be prosecuted with more exactness."[3] This was not to be; the daily press of other duties for the Society and on his own account, the fire of London and new responsibilities in the subsequent rebuilding of the city, crowded upon Hooke; quite possibly he saw no simple means of solving the technical problems this direct method imposed, and that determination had to await the attention of lesser talents with better equipment.

Mariotte[a] and the Mutual Recoil of Barrel and Projectile

In 1673, some 35 years after Galileo's studies on bodies in motion published in his *Dialogues on Two New Sciences*,[4] Mariotte developed some of Galileo's postulates of 1638 in a work entitled *De la Percussion ou Choc des Corps*.[5,6] It was no doubt in considerable measure derivative of three earlier works on the same subject by John Wallis,[7] Christopher Wren,[8] and Christiaan Huygens,[9] and precipitated a controversy over priority with Huygens, who was no less involved in disputing with Wallis and Wren.[10] However this may be, the work of Mariotte was notable for "clarity and a deep sense of the physical and experimental method, which makes it a truly modern book."[11] Moreover, Mariotte "enriched his theme with multiple experiments, and analyzed, better than his predecessors, the elasticity of bodies.[11] In the course of this analysis he chose the fruitful analogy of a discharging firearm, the explosion of the gunpowder sending piece and projectile flying in opposite directions to illustrate the mutual recoil of elastic bodies after impact.

Mariotte began his study by examining the Galilean Principles in a series of Suppositions which in part anticipate Newton's Laws. The first three of them are familiar:

I. A body once set in motion, will always continue its motion in the same direction and with the same velocity if it is not stopped by encountering another body or some other cause.

II. Bodies that are pushed up from below by different forces, rise to different heights, and these heights are to each other as the squares of the velocities with which these bodies began to rise. Reciprocally, bodies that fall from different heights to the same horizontal surface by their own weight, meet this surface at different velocities, the squares of which are to each other as are these heights.

[a] Edme Mariotte (-1684). A celebrated French physicist who in that country is usually credited with the discovery of the inverse relationship of pressure and volume that we attribute to Boyle. An English report of his discovery of the blind spot is in *Philos. Trans.*, 1668, *3*, 668-671.

III. If a body such as B, suspended by a thread AB, is pushed upward perpendicularly from below, and rises to the height BD, when it is pushed horizontally, so that it begins its movement with the same velocity, it will rise to the same height at C, by the arc BC, the line CD being supposed to be horizontal. [Figure 1 is Mariotte's illustration of this relationship.]

From these fundamental Suppositions Mariotte drew a number of Propositions concerned with the moment of inertia, which he called the "quantity of movement," as follows:

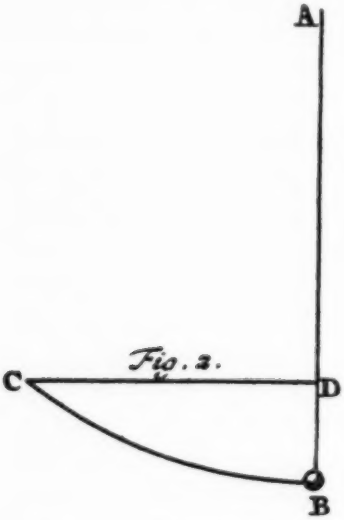

FIG. 1. Mariotte's equation of free-fall and pendular movement.

Proposition VII: If two bodies of unequal weights are moved with unequal velocities, their quantities of movement are proportional to their weights.

Proposition VIII: If two bodies of equal weights are moved with unequal velocities, their quantities of movement are proportional to their velocities.

Proposition IX: If two bodies have unequal weights and velocities, their quantities of motion are proportionate to the multiple of their weights and velocities (stated in mathematical terms, $M_1V_1 = M_2V_2$).

Propostion XV: If two elastic bodies meet directly with velocities reciprocal to their weight, each of these bodies will recoil at its original velocity.

These Propositions he illustrated by experiments with bodies falling as pendula, which could be dealt with as free falling bodies with simple trigonometry, as shown in Figure 2.

Exposition is simple [he wrote] with the machine described in the first Proposition, if one employs balls of ivory instead of those of clay. For if the ball H is double the ball G, and one places the ball G at a distance of 16 degrees from the point L, and the other at a distance of 8 degrees from the point I; when one releases them against the other, one will see them rise after their collision just about to the points from which they began their fall; and consequently they had regained after the collision the same velocities that they had before the collision. And if the ball H is triple the ball E, and one places the ball G at a distance of 12 degrees from the point L, and the other at a distance of 4 degrees from the point I, one will see ball H recoil to 4 degrees, and the ball E recoil to 12 degrees or very nearly.

One can apply this reasoning [Mariotte then saw] to explain the recoil of cannon and other firearms. Thus, for example, if one has a little mortar loaded with a ball eight times lighter than the mortar, and places it horizontally so that its recoil will not be impeded, the powder, being ignited, will have by the spring of the flame the same effect on the mortar and the

ball that the spring had on the two unequal balls, that is to say, that the velocities of the two bodies in separating will be inversely proportional to their weights, and that the ball will go with a velocity eight times greater than that with which the mortar will recoil.

This relationship was then illustrated in an experiment on the reciprocal relationship of the weights and velocities of barrels and bullets in the following manner:

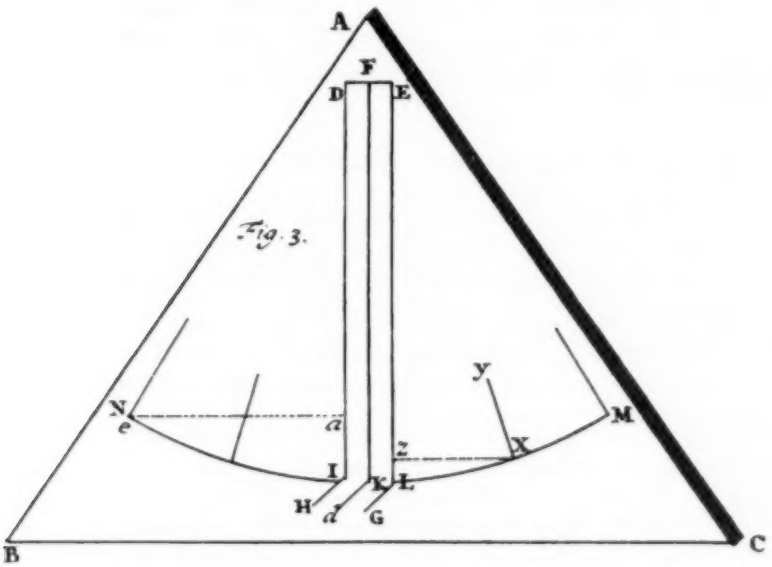

FIG. 2. Mariotte's experiment on mass-velocity relationships of firearm and projectile.

A pistol barrel is suspended by its ends with two little threads a foot long which are attached to a larger one 33 feet long. In the same way and at the same height is suspended a little cylinder of iron; the two suspending threads are a foot apart, and after charging the barrel with a little powder weighing about 12 grains, it is pressed in with paper, and over the paper is placed a little stick of wood, very light, and then instead of the ball the little cylinder of iron is inserted into the barrel until it touches the stick. The barrel weighed 62⅔ times as much as the cylinder of iron with the paper and baton and all being in a horizontal situation the powder was ignited; the barrel recoiled to 8 feet, and the cylinder of iron rose by a [distance along the] circumference of the circle of 48 feet. [The discrepancy in distance actually travelled by the projectile and its predicted course Mariotte correctly assigned to air resistance.]

In a more carefully arranged series of experiments Mariotte outlined against the wall two quadrants of a circle like those of Figure 2; they had a radius of 10 feet, the separation of the suspending threads was about 5 inches:

A barrel is employed of very small calibre, but it is loaded with lead behind, so that it weighs 5 times as much as the little cylinder of lead which acts as the ball, which has a weight of 3 ounces. The powder placed in the barrel had only the weight of three grains.

Here is a table of experiments that were made.

Recoil of the barrel	Elevation of the cylinder
9½ degrees	47 degrees
5¼ degrees	26 degrees
16½ degrees	82 degrees
13½ degrees	62 degrees
8 degrees	40¼ degrees

All these experiments correspond very closely to the reciprocal proportion of weights and velocities.[b]

BENJAMIN ROBINS AND THE BALLISTIC PENDULUM

In 1742 Benjamin Robins[c] applied Mariotte's principles to the actual calculation of velocity of the projectile in his *New Principles of Gunnery,* which according to one military historian was the foundation of gunnery as a "new science deduced from experiments and nature"[12] (p. xvii). In a review of this book in the *Philosophical Transactions,* which Robins himself wrote, he tells of the inception of the technique of the ballistic pendulum:

And first, it is evident, that . . . a method of discovering the velocities of bullets [must] be previously established . . . The machine for this purpose is described in the 8th proposition, and the principle it is founded on is this simple axiom of mechanics; that if a body in motion strikes on another at rest, and they are not separated after the stroke, but move on with one common motion, then that common motion is equal to the motion with which the first body moved before the stroke: when, if that common motion and the masses of the two bodies are known, the motion of the first body before the stroke is thence determined. On this principle then it follows, that the velocity of a bullet may be diminished in any given ratio, by its being made to impinge on a body of a weight properly proportioned to it; and hereby the most violent motions, which would otherwise escape our examination, are easily determined by these retarded motions, which have a given relation to them. Hence then, if a heavy body greatly exceed-

[b] Mariotte continued in an admirable extrapolation of his ballistic experiments to fit propulsion and rocketry, which was not entirely correct, for the mutual recoil of rocket and the gases resulting from combustion of the fuel and of jet of water and container takes place in the absence of atmosphere.

[c] Born in Bath in 1707 and coming to London in his early youth, Benjamin Robins was soon attracted to the newly enunciated Newtonian Principles and remained throughout his life their strong supporter. Elected to the Royal Society at an early age, he became popular as a teacher of mathematics but later turned to the more practical arts of the engineer, taking an interest in the drainage of marshes, the construction of bridges, the navigation of rivers, and the art of fortification. Although he never held military rank, there is reason to believe that he was close to the Navy and Army; he was for instance supposed to have "ghost-written" Lord Anson's 'Voyage around the World.' At the age of 42 he was appointed Engineer-General to the East India Company with a view to reconstruction of their forts and while at Fort St. David in Madras he was stricken with a malignant fever of which he died on 29 July 1751.

ing the weight of the bullet, whose velocity is wanted, be suspended so that it may vibrate freely on an axis in the manner of a pendulum, and the position of the axis of oscillation, the velocity with which the bullet is impinged will be determined, as is largely explained in the 8th proposition.[13]

This is of course an adaptation of Mariotte's experiment; it follows even more closely the suggestion of Cassini, the noted French astronomer, who also was interested in ballistics,[14] and had employed a moveable target of considerable mass to receive the impetus of the projectile in experiments carried out at the request of the Academie des Sciences in 1707, and reported briefly as follows:

Mr. Carré having reported to the Academy certain experiments that one of his friends had made on firearms loaded in different manners, it was desired to verify them, and Mr. Cassini *fils* undertook them.

He made a type of machine where there was a piece of wood, covered at one end with a sheet of iron thick enough to receive the shots from the same musket, discharged always from the same distance. This piece is mobile, and yields to the shot more or less, according to whether it has more or less force, and at the same time mark, by the construction of the machine, how much it had given way.

In *New Principles of Gunnery*,[13,15] Proposition VIII describes Robins' technique, "to determine the velocity, which any ball moves with at any distance from the piece, it is discharged from."

The simplest method of effecting this [it continues] is by means of an instrument like to that exhibited in the engraved figure [Fig. 3] where ABCD represents the body of the machine composed of the three poles B, C, D, spreading at bottom, and joining together at the top A; . . . On two of these poles, towards their tops, are screwed on the sockets RS; and on these sockets the pendulum EF GHIK is hung by means of its cross piece EF, which becomes its axis of suspension, and on which it must be made to vibrate with great freedom. The body of this pendulum is made of iron, having a broad part at bottom, which cannot be seen in this scheme; but its entire shape is represented in the annexed figure A.

The lower part of the pendulum is covered with a thick piece of wood GKIH, which is fasten'd to the iron by screws. Something lower than the bottom of the pendulum there is a brace OP, joining the two poles to which the pendulum is suspended; and to this brace there is fasten'd a contrivance MNU, made with two edges of steel, bearing on each other in the line UN, something in the manner of a drawing-pen; the strength with which these edges press on each other being diminished or increased at pleasure, by means of a screw Z going through the upper piece. There is fastened to the bottom of the pendulum a narrow ribbon LN, which passes between these steel edges, and which afterwards, by means of an opening cut in the lower piece of steel, hangs loosely down, as at W.

This instrument thus fitted, if the weight of the pendulum be known, and likewise the respective distances of its centre of gravity, and of its centre of oscillation, from its axis of suspension, it will thence be known,

what motion will be communicated to this pendulum by the percussion of a body of a known weight moving with a known degree of celerity, and striking it in a given point. . . .

Hence then, if a bullet of a known weight strikes the pendulum, and the vibration, which the pendulum makes in consequence of the stroke, be ascertained; the velocity, with which the ball moved, is thence to be known.

The extent of the excursion, made by the pendulum after the blow, was measured by the ribbon LN. The pressure of the edges UN on the ribbon was adjusted by the screw Z, until the motion of the ribbon between them was free, but with some minute resistance. The pendulum being at rest, the part LN between the pendulum and the edges was drawn strait, and a pin fixed in that part of the ribbon at the edge of the clamp. The pendulum swinging under the impact of a ball, drew out the ribbon to the full extent of its excursion, which was determined by the interval on the ribbon between the edges UN and the place of the pin[15] (Vol. I, 83-91).

Correcting for the true moment of the pendulum and for the true arc traversed by the center of the pendulum at the point of impact, he calculated, in a particular experiment, that when the ribbon was pulled out 171/4 inches, the pendulum must have been given a velocity of 31/4 feet per second. The pendulum weighing 505 times the bullet, the velocity of the bullet at the moment of impact must have been 1,141 feet per second.

THE BALLISTIC GALVANOMETER

A full century later the ballistic pendulum was well established in the armamentarium of the scientific gunner. At Metz where the French artillery had its École d'Application for those who chose this branch of service after their basic science years at the École Polytechnique, Poncelet, Morin, Piobert, and others concerned with applied mechanics were working on the ballistics of guns of large caliber with large-scale pendula, while in the laboratories of the École Polytechnique related problems were attracting attention. It is understandable then how Pouillet, Professor of Physics at the École and Director of the Conservatoire Nationale des Arts et Metiers, should think of the ballistic pendulum when dealing with the new physical tool, the galvanometer. This instrument was then hardly more than 20 years old;[d] its chief defect was its slow

[d] Oersted discovered electromagnetism in 1820 and Schweigger first noted the multiplication of the magnetic effect when a coil was employed instead of a single straight piece of wire. We have written about the galvanometer in physiological perspective in *Bull. Hist. Med.*, 1957, *31*, 212-234; 327-347.

response time, the price paid for high sensitivity. It is known from Matteucci and DuBois Reymond that response times of 10 secs. to a full minute were not unusual in galvonometers of these times constructed with enough sensitivity to deal with weak bioelectric potentials. Pouillet may indeed have read Robins' statement that "on this principle then it follows that the velocity of a bullet may be diminished in any given ratio, by its being made to impinge on a body of a weight properly proportioned to it; and hereby the most violent motions which would otherwise escape our observation, are easily determined by those retarded motions, which have a given relation to them," for he wrote, in establishing an analogy between the ballistic pendulum and the galvanometer, that,

> If thus an electrical current can operate in a regular and identical manner during a very short instant, as for example in a thousandth or a ten-thousandth of a second, and if it can by an action thus brief produce on an appropriate magnetic system an initial impact, and a primary deflection slow enough, and of a great enough amplitude, nothing would be more easy than to determine with exactitude intervals of time that could be reckoned in thousandths or ten-thousandths of a second.

This idea was applied to ballistics in the following manner.

> The two terminals of a circuit including the galvanometer and a Daniell cell,* are fastened, one to the firing cap in place on the nipple and the other on the hammer of the gun, the whole circuit being isolated from the barrel. A portion of the wire passes in front of the mouth of the barrel at some distance, in such a manner as to be cut by the ball at the instant it emerges. That is the whole apparatus. When one fires, the current passes thus during all the time that elapses from the instant the hammer hits the cap, up to the moment when the ball cuts the wire. The deflections produced in various experiments made with the same charge of powder are perfectly in accord. Observations are made with the greatest facility, and with the charge that I have employed, the extreme values are from 1/40th to 1/50th of a second for the time that passes from the instant the cap is hit to the instant the ball leaves the barrel.†
>
> To apply the same principle to the study of the speed of a projectile in different parts of its trajectory, it suffices to lay out in its path a system of silk threads, and more distant a system of conducting wires, so that in breaking the conducting wires, it will suppress it.‡ The deviation observed thus gives the time of flight.[16,17]

* The Daniell cell was an early successor to the voltaic cell and was designed primarily to avoid polarization and other defects of the simpler cell. It consisted of a porous cup containing sulfuric acid and the zinc electrode, immersed in a container of copper sulfate and the copper electrode. Because of its stability it was often used as a reference voltage (1.07) and the physiological literature of the 19th century contains many references to Daniells rather than Volts.

† Expressed in physiological terms, Pouillet here measures the "latent period" of the gun shot, using the initial event, the fall of the hammer, to start current flowing in the ballistic galvanometer, and the emergence of the ball from the barrel to stop its passage; the analogy with Helmholtz's later technique is striking.

‡ Here is recognition that velocity is not uniform during all parts of the trajectory and direct observations must be made.

The instrument was calibrated empirically by passing the current from the same source of voltage used in the test through an interrupter or rheotome fashioned from a spinning disk which delivered current only when the sliding contact crossed a strip of metal fastened as a radius on the disk.[h] From the rate of rotation, the width of the conducting strip, and the radius of the disk at the point of contact, the duration of current flow could be determined, and a curve constructed relating the duration of current flow to galvanometer deflection. Thus time could be read off the curve once the amplitude of a deflection was determined.

THE BALLISTIC GALVANOMETER AND VELOCITY OF THE NERVE IMPULSE

In January of 1850 Johannes Müller presented the first account of Helmholtz's determination of the velocity of the nerve impulse to the Akademie der Wissenschaften in Berlin.[18] Soon thereafter another and virtually identical account appeared in the *Comptes Rendus* of the Académie des Sciences.[19,20,21]

I have found [wrote Helmholtz] that the nerve impulse, in travelling from the sciatic plexus to the gastrocnemius muscle, requires an interval of time that is not too difficult to ascertain. Here is the way the experiment is arranged.

I place the sciatic plexus in the circuit of a double galvanic induction coil. The muscle is arranged so as to lift, by its contraction, a certain weight, which during relaxation of the muscle, rests by a platinum point on a gilded plate. At the moment when the inducing current of the double coil is broken, an instantaneous current crosses the sciatic plexus and provides the nervous stimulation. But, by the aid of a particular mechanism, it happens that at the same moment another galvanic circuit is established across a galvanometer, the weight suspended from the muscle.[i]

It is this duration which must first be ascertained. This is easily accomplished with the aid of the impulsion which the current, in its passage, gives to the magnetic needle of the galvanometer. Obviously, having regard to the instantaneousness of the current, the amplitude of the impulsion could be taken as a direct measure of its duration. Knowing thus the duration of an oscillation of the magnetic needle and the amplitude of a deviation produced by the continuous current, one can determine the duration of a current which produces a given deflection. This is, as one sees, the method of M. Pouillet modified according to the conditions of the experiment.[i]

[h] Accurate assessment of short intervals of time was usually facilitated in such experiments (i) by use of gearing which permitted the rate of spin of the chronometric disk to be calculated from the slower rotations of the drive wheel, and (ii) by the use of disks of substantial diameter which even at relatively slow rates of rotation gave good linear resolution.

[i] Note the close analogy with Pouillet's determination of the latency of the gunshot. Helmholtz thus adopted from Pouillet not only the instrumentation but an essential part of the experimental design.

Fig. 3. Robins' ballistic pendulum.

Noting that the latent period thus measured varied if either the mass of the weight or the strength of the stimulus, and hence the strength of contraction were varied, Helmholtz continued:

> It goes without saying that the time that the nervous excitation takes to traverse the nerve cannot depend on the magnitude of the load on the muscle, nor upon the height to which this load is lifted. It must therefore be that, independent of this interval, there passes between the arrival of the excitation at the muscle and its action, an interval that can be eliminated by maintaining constant the conditions that determine its magnitude, while causing to vary, on the contrary, the length of the pathway of the excitation in the nerve. This is why one succeeds by placing in the induced current of the coil alternately the sciatic plexus and the portion of the nerve closest to the muscle. . . .
>
> In this way I have been able to establish that in stimulating alternately the upper and the lower portions of the nerve, the contraction begins a little later in the first case than in the second. The delay is manifest in the greater impulsion impressed on the needle of the galvanometer in the first case; and the proof that it does not derive from any other cause than the longer pathway to travel in the nerve, is that its duration was constant for the same individual, whatever weight was suspended from the muscle. . . .
>
> Here finally are the figures of my experiments. The distance between the points stimulated on the nerve being 50 to 60 millimeters, the nervous excitation took 0.0014 to 0.0020 seconds to traverse this distance.

These data give velocities of 25 to 42.5 meters per second for the nerve impulse. In these preliminary accounts, the calculation itself was not made; it appeared first in the more detailed description in Müller's *Archiv* of the same year.[22,23] Here a table of velocities showed ranges from 24.6 to 38.4 meters a second, and the classical mean figure of 30 meters a second was first presented. Here also appeared the report of graphic registration of the muscular construction on a smoked sheet of glass, displaced linearly by clockwork, or rotated as a drum. Helmholtz' article "On Methods of Measuring Small Portions of Time, and Their Application to Physiological Purposes," which appeared in the *Philosophical Magazine* in 1853[24] makes it clear that Helmholtz had indeed thought of measuring the latent period on such records, and from them deriving the velocity of the nerve impulse. Despite the manifest saving in time and effort this method promised, Helmholtz wrote that "it must be confessed that up to the present time, I have not attained the same degree of exactness and agreement in the results." One of the problems Helmholtz recognized—as have many since: "the commencement of contraction is, according to this (method) not sharply defined; we cannot make use of it as the limit of the time to be measured." Despite these reservations, the graphic method when meticulously applied, gave results not greatly

divergent from the more trustworthy figures from the ballistic method.[25,26]

Thus was Helmholtz able to dispose of "earlier physiological theories [which] were inclined to regard the agent which propagates itself through the nerves as electricity, and hence believed it to be necessary to attribute to it an immense velocity." Instead, "it belongs, therefore, to the same class of physical phenomena as that to which the propagation of sound belongs, and thus an inordinate velocity, such as that supposed, is rendered improbable."

CONCLUSION

This account of the lineage of one of the great experiments of physiology—the determination of the velocity of impulse transmission in nerve—shows how clearly it was derived from a much older search in ballistics for an adequate method of measuring the velocity of a missile, first succeeding in the invention of the ballistic pendulum, based fundamentally on an understanding of the reciprocal relation of mass and velocity in calculating momentum. It illustrates how widely indeed a single clear concept may reverberate, illuminating areas of science and technology seemingly of such little association one with the other as, in this instance, ballistics and neurophysiology. It shows, too, how the ingenious mind seizes such a concept and molds it, so to speak, to its own purpose; thus Mariotte was interested in a basic phenomenon and employed ballistics as an example, while Robins saw in Mariotte's work an answer to one of the primary problems of ballistics. Pouillet for his part found a means of capitalizing on the very defects of the galvanometer to make it yield paradoxically the kind of information—on short intervals of time—that it seemed least likely to be able to provide, by perceiving an electrical analogy to the mass-velocity relationship. Finally, Helmholtz caught the fundamental analogy between velocity of a bullet and the nerve impulse and adapted the methodology of ballistics to his own purposes. Through the ingenious mechanism by which the muscular contraction shut off the current which had begun to flow in the ballistic galvanometer at the moment of nervous stimulation, he was able to measure the latency of muscular contraction. The motor nerve being stimulated at two distances from the muscle, the essential data were obtained for the calculation of the velocity of the nerve impulse.

It would indeed appear that one of the primary attributes of inventiveness, if not of genius itself, is the ability to recognize and

to adapt to new purposes the concepts and the tools that other sciences have provided.

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William Gunn Malin (1801-1887)

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WILLIAM Gunn Malin dominated the scene at the Pennsylvania Hospital in Philadelphia for more than half of the last century. Almost entirely self-educated, he served the hospital in positions of increasing importance and made significant professional contributions to medical librarianship and hospital management.

Born in Woodford near Byfield, Northamptonshire, England on 7 November 1801, Malin was a descendant, through his maternal grandfather, of Olaf Rolfson, a famous Viking and Vice Jarl under the Earl of Orkney and Caithness. The youngest son of this Norseman was Cunni, a name now preserved in the surname Gunn. Malin's paternal grandfather, William Malin, lived in Preston Capes, Northamptonshire, England; Malin's father, John, moved to Woodford Halse where he married Mary Gunn of Banbury. Both parents were deeply religious Moravians but were able to provide their son with only scant formal schooling at Eydon and to prepare him to be market carrier to Banbury and Deventry.

But Malin wished for better things. In 1823 he came to the United States, intending to land in Baltimore. However, a storm drove the ship, the *Massasoit*, to Boston, thereby avoiding the Baltimore yellow fever epidemic. From Massachusetts, Malin made his way to Germantown, Pennsylvania, where for a year he drove a beer wagon. Out of his savings he returned his passage money to his parents and then proceeded to Philadelphia. His long career with the Pennsylvania Hospital began on 29 March 1824 when he was appointed clerk. A year later, the committee in charge of the library was influential in securing his appointment to the position of librarian of the first public medical library in the country.** In 1840 he was promoted to Steward (i.e., Administrator) of the new Department for the Insane in West Philadelphia; then finally, in 1849, he became Steward for the Department of the Sick and Injured in Philadelphia, where he remained until his retirement in 1883.

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** The Medical Library of the Pennsylvania Hospital was founded in 1762, 14 years before the signing of the Declaration of Independence; a special committee to take charge of the library was formed in 1822.

Since he was a true bibliophile, the medical library flourished under his custodianship, and a large collection of rare and valuable books was acquired. With penmanship that was almost like engraving, he numbered and classified the books in the library and compiled an excellent catalogue of the holdings, continuing a tradition established in 1790 when only 528 volumes were catalogued. The development of the library into numerical and scientific importance under his direction is evident in Malin's first catalogue published in 1829 (together with his "Sketch of the History of the Medical Library") and in the catalogue republished with a supplement in 1837, when there were 7,300 volumes in the library.[5] The rate of growth of the library was more than 150 titles per annum. After Malin's appointment as Steward of the Department for the Insane, Dr. Emil Fischer compiled the 1857 edition of the catalogue. The collection had increased to 10,500 volumes, and in his preface Fischer wrote that this medical library represented "one of the best, if not the best, collections of medical works in this country . . . a result greatly owing to the interest taken in the choice and purchase of works by Mr. Malin."[2]

Malin not only had a librarian's knowledge of the books, but he was also familiar with their contents. Many of the books contain interesting annotations, testifying to his perusal of them. He is generally regarded as the person who acquired almost all of the great medical classics for the library as well as the early editions of the famous Italian anatomists of the 16th century and their followers in other countries. The second folio edition of Vesalius' *De humani corporis fabrica* of 1555 and 15 medical incunabula are among the treasures, along with early editions of 18th century English and French medical writers. Although the library was supposed to acquire books strictly medical, Malin also included books from the collateral sciences such as the first American work on insects, Thomas Say's *American Entomology* (Philadelphia, 1824). Because of his attitude toward subscribing to and saving medical periodicals, the library started to collect complete sets of the older medical journals, including *Lancet, American Journal of the Medical Sciences,* and *Virchow's Archiv.* He also saved the old herbals which had accumulated in the hospital's apothecary and made them part of the permanent collection of the library.[4]

Although he had no predilection for medical studies, Malin was well informed in medical affairs. His special interest was in the treatment of the mentally ill. It is difficult to trace his specific con-

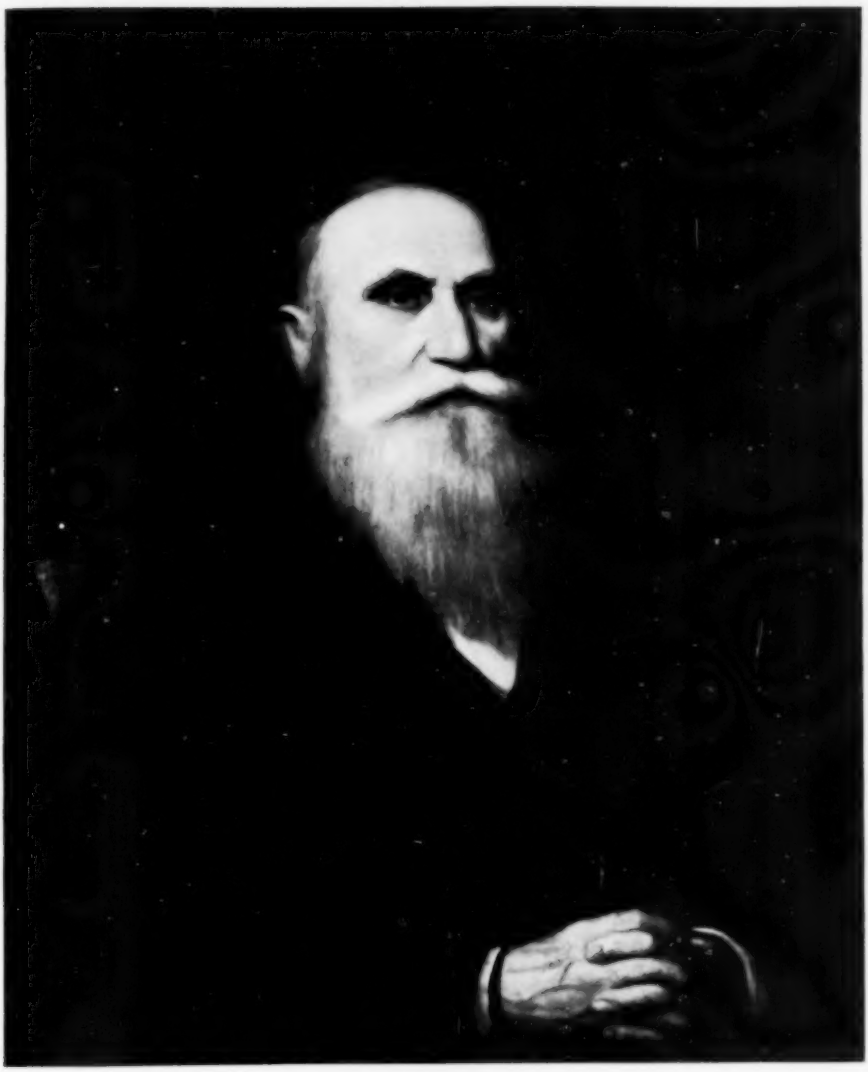
tributions in the management of mental patients; however, two of his articles stand in testimony of his advanced ideas on the subject. First, in 1828, when Malin had been at the Pennsylvania Hospital only two years, he wrote an article to the Board of Managers of the Hospital under the title, "Remarks on the present state of the Pennsylvania Hospital and a plea for the necessity for providing a separate asylum for the insane."[9] Then in 1834 he wrote a second article on the employment of the insane. Both papers are precisely written, and in neither of them does Malin accept any personal credit for the ideas advanced. On the contrary, he attributes the successes of the hospital to the Managers—"The comfort of the unfortunate beings committed to their care has been regarded by them with deep interest, and they have always been disposed to listen to any practical suggestions for its increase"—and to Dr. Benjamin Rush, Father of Psychological Medicine in America—"[the] . . . philosophic mind of the venerable Rush . . . was long and anxiously devoted to the consideration and improvement of the moral and medical treatment of the insane."[9]

In these papers Malin made suggestions and gave explanations which illustrate his interest in occupational and recreational therapy as well as his insight in the rehabilitation of the mentally ill. He regarded "employment of the insane in useful occupations as proper, healthful and safe . . ." and that "exercise of the body . . . is necessary to its health, and will . . . be admitted to have also a salutary influence upon the mind. We have daily opportunities of observing how much it conduces to mental tranquility. But labor, to be beneficial, must be in some measure suited to the rank and prejudices of the patient." He also understood the concepts of total patient care: "When the few faculties left him are depraved the whole man is degraded"; and ". . . everything which encourages proper self-respect is useful in promoting . . . his chance of recovery." His regard for the human dignity of man is apparent in his plea for pets: "I love to see a patient adopt some animate pet, if it be but a mouse; it appears to have a humanizing and happy influence; attention gives to the insane an occupation and interest in something out of themselves and their delusions, while, in their isolated situation, it is a source of pleasure to feel that some creature is dependent upon them for its comfort, and perhaps, in return, loves them." He emphasized that "amusements require regulation and encouragement of a superintendent" and that there should be proper "protection of the patient from injury, but no

restrictions when properly supervised." In addition, "amusements of almost any kind become, for a time, a business, one might say a rage; they are followed up unreasonably, until, after a while, satiety follows, and all the parties subside into downright indolence . . . particularly with regard to indoor amusements." Apparently, he was not afraid to be constructively critical: "The founders of existing asylums for those afflicted with mental maladies do not appear to have been sufficiently impressed with the importance for their *cure*. Unfortunately to *secure* seems to have been, in most instances, a paramount consideration."

It is no surprise then, that in 1840, when the new Department of the Insane of the Pennsylvania Hospital was established in West Philadelphia, Malin was appointed Steward to organize the operation and management of the institution. One of his earliest tasks there was to move works on the "Mind and Mental Diseases" as well as works of a general literary character to the decentralized library at the West Philadelphia location. His tenure here lasted until 1849, when the Managers promoted him to Steward at the Pennsylvania Hospital. However, interest in his ideas on the care of the mentally ill continued, and both of the aforementioned articles were read at the Philadelphia meeting of the Association of Medical Superintendents of the American Institutes for the Insane in 1851. The historical value of the first article was recognized by the State Board of Public Charities of Pennsylvania and they republished it in their Annual Report for 1884. The State Committee on Lunacy republished both papers in its Annual Report for the same year. Today, an examination of the numerous principles and suggestions for the moral management of the insane advanced by Malin shows that he was far ahead of the practice of his time.

A devoted member of the Moravian Church, Malin began his scholarly pursuit in the history of it during his tenure at the Department for the Insane. He spent endless periods poring over catalogues of rare books sent to him by dealers throughout the world and in choosing the literature he needed to understand the history and pre-history of his church. Self-educated, he diligently studied the books he loved when away from hospital management. The works in his personal library he collected for more than 40 years. Many of them were in Latin, Danish, Dutch, French, German, and Italian, but he had become so well informed that he was able to translate from most of them. This is obvious in the several papers he wrote to be included in the appendix to the catalogue of his per-



William Gunn Malin (1801-1887)
(From portrait in Pennsylvania Hospital)

sonal library which was published in a limited edition in 1881.[6] He managed to gather a great deal of contradictory data from his volumes and then to present them in a logical, analytic fashion before drawing his own conclusions, much as in scientific papers today.

The books in his personal library cover a wide range of subjects from and about the old Kingdom of Bohemia, making them especially important for the contemporary scholar of Central European affairs. The collection is by no means one-sided; Roman Catholic, Hussite, and other Protestant approaches to the controversy of that era are presented in full. Some of the unique editions in the collection date from the 15th century, having survived the Hussite Wars and the Thirty Years' War as well as the attempts at destruction imposed by the *Index Bohemicorum Librorum Prohibitorum et Corrigendorum*. Modern restrictions on the export of rare books from certain countries make Malin's library an outstanding repository which cannot be duplicated. In a letter to Mr. August H. Seibert of Bethlehem dated 17 March 1881, Malin formally expressed his wishes for making the Moravian Theological Seminary in Bethlehem, Pennsylvania heir to his collection:

> My collection of Moravian books has become so considerable that it would, I think, be a pity to have it again dispersed. I therefore intend to give it intact to the P[rovincial] E[lders] C[onference] or perhaps to their care for the use of the Seminary. At any rate to keep it together.

All of these books may be consulted within the fireproof Archive Building of the Moravian Seminary on the campus of the Moravian College in Bethlehem.

After Malin's return from the Department for the Insane to the Department for the Sick and Injured, he married a former patient of the hospital (in 1849). She died in a little over a year, leaving no children. Malin never remarried.

Malin administered the hospital with the strictest integrity, and there is no evidence of any unpleasantness with the physicians of the institution throughout his long career. He was meticulous about keeping all kinds of hospital statistics. When he could find no proper place for a set of figures that had been compiled, he would neatly file them in an appendix. Examples of this kind of data can be found in the following tables appended to various reports:

Managers of the Pennsylvania Hospital with year elected, resigned and length of time in service.

Insane patients by sex, with result of their treatment.

Long-term patients and duration of their confinement. [One of these was a lady who was confined 41½ years!]

Age of insane patients.

Special Lying-in Department Report.

Special report on cases of "Mania a Potu" or Delirium Tremens.

In the prefaces to many reports Malin often commented on the need to evaluate numbers and other statistics judiciously in order not to be misled.[7,8] He had an acute sense of history and a regard for tradition. His first description of the Pennsylvania Hospital[7] is a continuation of the description initially written by one of the founders of the hospital, Benjamin Franklin,[3] less than 75 years before. In all of his reports, Malin preserved original headings and factual information as they appeared in Franklin's report. It is Malin, also, who obtained some of the cuttings of the Treaty Elm (where William Penn made his first treaty with the Indians) and planted them within the grounds of both the hospital and the mental institution.[9]

Advanced years and failing health forced him to resign his post on 29 March 1883. His term of service lasted 33 years, 10 months, and 21 days, and the Board of Managers rewarded him with a pension and a suite of rooms at the hospital. There he remained until his death from pneumonia on 2 August 1887.

Few persons passing his portrait in the main lobby of the hospital are able to identify the man, but William Gunn Malin contributed much to medical librarianship, medical bibliography, hospital management, and mental health. His aspirations for the care of the mentally ill were recognized beyond the boundaries of his own hospital. No less tangible is his contribution to the present-day study of the Czech Renaissance and the pre-Protestant Reformation in Central Europe. These stand as living memorials to the man buried on 5 August 1887 in Woodlands Cemetery, Philadelphia.

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Incomes of Medieval English Doctors

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THE emoluments of medical practitioners in medieval England varied widely. In general their fees and perquisites, like those of their modern counterparts, were proportionate to the peculiar skill and personal prestige of the particular physician or surgeon. Certain eminent physicians could command enormous fees from their well-to-do clients while even disdaining to offer their services to the suffering poor, but most appear to have gauged their fees on a reasonable scale with allowances being made for the total economic incompetence of some patients. Those men of medicine whose treatments or techniques were rare, or were matters of carefully guarded professional secrecy, could demand and obtain an imposing fee. Their services seem to have been almost monopolized by families of prominence. On the other hand, ordinary or specific remedies and treatments, often administered by local leeches, could be procured at low cost, or in the case of paupers, possibly at no cost at all. Since English medical practice in the two centuries following the Conquest was largely the work of churchmen, there developed a prevailing influence which exhorted the physician and surgeon to give of his services freely to the poor. It is the purpose of this brief study, however, to explore the types of financial arrangements commonly existing between physician and patient during the later centuries of the medieval period and, wherever possible, to determine the exact fees and rewards.

Although leechbooks and herbals were by no means rare in England in late Anglo-Saxon and Norman times, it was not until the 14th century that significant medical treatises came from the pens of English doctors.[1] This can be explained principally by the fact that for almost two centuries after the Conquest the great majority of literate physicians of England were monks or priests, and their writings, even on the subject of medicine, disclosed few of the practical interests and concerns of the professional medical

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1 The *Compendium medicinae* of Gilbertus Anglicus (d.1250) can hardly be assigned an English origin, while the medical writings of Richard of Wendover were completed before their author returned to England for his declining years. For a general introduction to the medical literature extant in England in the Anglo-Saxon era, see *Leechdoms, wortcunning and starcraft of early England*, Rev. O. Cockayne, Ed. 3 vols., Rolls Series (London, 1864-1866), especially the introduction to volume I. See also the general survey in J. H. G. Grattan and Charles Singer, *Anglo-Saxon magic and medicine* (London, 1952).

practitioner. Furthermore, it was only in the 14th century that the surgeon began to emerge from the less-than-honored role of barber-surgeon to become a professional man of some account. Not until he had "arrived," by way of the university, would he have been likely to produce written discourses on his art. Consequently, it is the writings of 14th century physicians and surgeons which reveal for the first time in England the social conscience and economic attitude of the medieval doctor. It is from these that we learn what a doctor might reasonably charge. It is in these that we are informed, sometimes explicitly, what was considered ethical and what was not.[2]

But one must look beyond the English writers to those of the continent for the earliest information on the economic aspects of British medical practice. Henri de Mondeville (1260-1320?), a physician to King Philip the Fair of France, was one of the first to record his views of medical fees, while his high degree of professional respectability assured him an international audience. In a treatise widely read throughout western Europe he boldly classified his clients according to their ability to pay and counseled his colleagues to do similarly:

> The first class are paupers who must be treated for nothing; the second class are a little better off and may send presents of fowls and ducks; they pay in kind. The third class are friends or relatives who pay no fixed fee, but send victuals or presents in token of gratitude but no money . . . Then there is a class embracing those who are notoriously bad payers, such as our nobility and their households, government officials, judges, baillies, and lawyers whom we are obliged to treat because we dare not offend them. (In fact the longer we treat these people the more we lose. It is best to cure them as quickly as possible and to give them the best medicines.) Lastly there is a class who pay in full, and in advance, and they should be prevented from getting ill at all, because we are paid a salary to keep them in health.[3]

Elsewhere in the same treatise it becomes increasingly apparent that de Mondeville was not only an accomplished master of surgery but a practical business man as well. On the psychology and the economics applicable to the members of his craft he advised:

[2] Medical deontology in the medieval period has been the subject of two splendid studies: Mary Catherine Wellborn, "The long tradition: a study of fourteenth century medical deontology" in *Medieval and historiographical essays in honor of James Westfall Thompson*, James Lea Cate and Eugene N. Anderson, Eds. (Chicago, 1938), and Loren C. MacKinney, "Medical ethics and etiquette in the early Middle Ages: the persistence of Hippocratic ideals," *Bull. Hist. Med.*, 1952, *26*, 1-31. Both scholars emphasize the unbroken continuity of Hippocratic ideals throughout the early Middle Ages and warn against the assumption that awareness of and sensitivity to a laudable code of medical ethics was a product of Salerno in the late Middle Ages.

[3] *Chirurgie de Maitre Henri de Mondeville*, E. Nicaise, Ed. (Paris, 1893), p. 91.

> The surgeon ought to consider three things when a patient comes to see him and arrange about the fee for an operation. First, his own position; secondly, the condition of the patient; thirdly, the state of the disease.[4]

The writer then advised his colleague to assess his own status in the community as to whether he was of great or small fame, whether he had enough clients already, and whether he was about to take on more important cases. Then the economic and social position of the client must be carefully considered, with an alert eye for rich men masquerading as paupers. At length, after such precautions the doctor was urged to

> charge the patient boldly a very large fee, though he may moderate it according to circumstances. To a rich man he should say 'The fee a surgeon ought to receive is a hundred pounds for this operation,' and if the patient is staggered by the sum he would continue 'but I did not say I was going to charge you that amount,' and thus little by little he lowers his fee.[5]

There follows additional advice against reducing the fee to less than a reasonable fixed minimum, for it was de Mondeville's opinion that it were better professionally to make no charge at all than to ask a fee which was too low. And finally come words of wise counsel which might belong to any century:

> The surgeon should pretend that he has no living (prebende) nor capital except his profession, and that everything is as dear as possible, especially drugs and ointment; that the fee is as nothing as compared with his services; and the wages of all other artisans, masons for example, have doubled of late. I repeat that the surgeon ought to charge the rich man as much as possible and get all he can out of them, provided that he does all that he can to cure the poor. You, then, surgeons, if you operate conscientiously upon the rich for a sufficient fee and upon the poor for charity, you ought not to fear the ravages of fire, nor of rain nor of wind; you need not take holy orders or make pilgrimages nor undertake any work of that kind, because by your science you can save your souls alive, live without poverty, and die in your houses.[6]

William of Salicet (1210-77),[7] who gained fame and wealth through the practice and teaching of surgery at Bologna, also addressed his colleagues on the collection of fees. For the sake of professional dignity he warned against stealing from patients while attending them. He cautioned all doctors against allowing undue familiarity from laymen generally, insisting that it made the collection of fees both awkward and difficult. It was his contention

4 *Ibid.*, p. 199.
5 *Ibid.*
6 *Ibid.*
7 These dates are assigned by Professor Castiglioni in *A history of medicine* (New York, 1941), p. 336.

that a large fee enhanced both the authority of the surgeon and the confidence of the patient. Still, on behalf of the profession he urged charity calls on the poor, observing that such calls benefited a surgeon's reputation.[8]

Thus came the best professional opinion of the times from two great continental surgeons. Such advice was echoed by the more eminent practitioners of England. Master John of Gaddesden (1280?-1361), himself never averse to collecting a handsome fee, admonished his fellow physicians to collect their fees in advance of the treatment.[9] Although he is known to have prepared remedies to be prescribed solely for the clients who could afford a large fee, he was not without compassion for the ailing pauper. For many illnesses he had concocted substitute remedies to be administered to those too poor to pay for the treatment. And it is to be inferred that he considered the latter to be about as efficacious as the costlier preparations.[10] Master John Arderne (1307-1390?), a celebrated surgeon of Wiltshire, Nottinghamshire, and possibly London, seldom lost sight of the ethical considerations of his profession. This famous specialist in fistula, haemorrhoids, and similar afflictions, instructed his colleagues to demand a good price for their services, pointing out that such a practice would bring advantage to the profession generally and to the leech individually. Arderne sought to standardize the fees for particular operations. With respect to the cure for fistula he wrote:

> Therefore for the cure of fistula . . . when it is curable, aske ye competently, of a worthy man and a gret an hundred marke or fourty pounde, with robes and fees of an hundred shillyng terme of lyfe by yere. Of lesse men fourty pounde, or fourty marke aske ye without fees; and take ye not lesse than an hundred shillyngis. For never in all my lyfe toke I less than a hundred shillyng for cure of that sekeness.[11]

Judging from these contemporary accounts we may deem the fees demanded by renowned surgeons and physicians to have been stupendous. Even for "a worthi man and a gret" one hundred marks, representing by conservative estimate perhaps thirty-five hundred or four thousand dollars in modern American currency, as a fee for a single fistula operation could hardly be regarded as a

8 *Chirurgie de Guillaume de Salicet*, Paul Pifteau, Ed. (Toulouse, 1898), pp. 3ff.

9 John of Gaddesden, *Rosa Anglica*, Winifred Wulff, Ed. Irish Texts Society (London, 1929), p. 291.

10 *Ibid.*, p. 101.

11 John Arderne, *Treatises of fistula in ano, haemorrhoids, and clysters*, D'Arcy Power, Ed. Early English Text Society, Original Series 139 (London, 1910), p. 6.

trivial sum.[12] Nor could Arderne's price of twenty shillings for a single application of mercury ointment in his treatment of scabies be interpreted as a nominal cost. Yet says this surgeon, "I have tried it many times and have made a great deal of money from it, and I got twenty shillings for a single application."[13] It is small wonder that collections were sometimes "slow" or that the medical writers of the times were so frequently preoccupied with the tactics and stratagems of fee-collecting.

The financial arrangements entered into by medieval English medical practitioners in their efforts to collect professional fees were of great variety and number.[14] For the well-established and highly reputable member of the profession the retainer fee or annuity was not uncommon. Royal and noble patrons usually engaged the services of their physicians and surgeons on this basis. The practice was perfectly consistent with the medieval concept of dignity as manifested in the retainer system of employment and with the element of personal loyalty duly owed by a vassal to his feudal lord. Many physicians were therefore attached to royal or noble households, were numbered among the retainers and thereby maintained a more or less constant contact with their employers. By the most common arrangement the practitioner could expect a stipulated salary or annual stipend, usually disbursed in two installments, one at Easter and one at Michaelmas, from whatever source the patron might designate. In many instances a debtor of the patron would make the payments directly to the physicians upon instruction from his creditor.[15]

12 The problem of arriving at an index by which the moneys of an earlier era may be translated into terms of modern buying power is always a perplexing one. At best only an arbitrary solution can be achieved, for economic historians are by no means in agreement on the matter. It is useful to recall here that the periods of most perceptible economic inflation did not occur until the Renaissance was well under way. Thus it does not seem unreasonable to ascribe to the English currency of the 13th century 70 to one hundred times its present value. By the latter half of the 14th century its value decreased somewhat, but even then it was perhaps 50 to 60 times as much as at present. One noteworthy effort by a medievalist to deal with this problem is that of Professor G. G. Coulton. Cf. his "The meaning of Medieval moneys," *Historical Association Leaflet*, No. 95 (London, 1934). The 13th-century English mark amounted to 13 shillings, 4 pence.

13 Cited in Arderne, *Op. cit.*, p. 111 from MS. Ashmol. 1434, fol. 131. The editor, Sir D'Arcy Power, observes further: "The fees charged by Arderne are very large, if it be remembered that the money had at least seventeen and perhaps twenty times its present (1910) value."

14 In a brief article, "The fees of our ancestors," *Janus* (May-June, 1909), pp. 287-293, Sir D'Arcy Power has considered the problem of medical fees in medieval England. He confined his study, however, very largely to the information to be found in the works of John Arderne, although he does mention two practitioners on the staff of Henry V for the French expedition of 1415. These men, Nicholas Colnet, physician, and Thomas Morstede, surgeon, are cited as receiving while on the continent 12 pence per day in addition to their customary allowances of 100 marks each per year.

15 Arderne, *op. cit.*, p. 111. Sir D'Arcy Power calls attention also to the medieval custom of paying for an operation by an annuity as well as a fee. This practice continued in England until quite late in the 17th century, by which time the practice of maintaining

A contract, usually written but sometimes verbal, was the common instrument. A patron of wealth often agreed to pay his physician an annual retaining fee with the particular obligations of the contracting parties specifically stated. Thus a certain Geoffrey, physician to John Thoky, Abbot of Gloucester from 1306 to 1329, had a written contract for his medical services to the abbot. Abbot John, for his part, had promised to pay to Geoffrey eight marks *per annum* "from his chamber during the whole life of the abbot." This document further stipulated that "whenever the abbot was sick and should send for him he should come to him, coming and returning at the charges (expense) of the abbot."[16] Henri de Mondeville's experience had led him to the conclusion that it was more satisfactory for a physician to be paid an outright fee for his services than to contract for an annuity. If an annuity should be accepted, however, the physician should secure a bond rather than accept a mere verbal arrangement. De Mondeville observed that

> The chief object of the patient, and the one idea which dominates all his actions, is to get cured, and when once he is cured he forgets his own obligations and omits to pay; the object of the surgeon, on the other hand, is to obtain his money, and he should never be satisfied with a promise or a pledge, but he should either have the money in advance or take a bond for it.[17]

The various rolls of England's chancery contain the records of innumerable disbursements to the royal physicians and surgeons. A few random examples will indicate the nature of the customary financial arrangement. In the year 1236 Master Ralph of Necton, recently arrived in the service of King Henry III, was granted fifty marks a year from the treasury until such time as an ecclesiastical benefice yielding twice that amount could be located for him.[18] Master Henry of Saxeby, surgeon to the same monarch, was granted ten pounds from the treasury until the king "shall provide him with land of that yearly value out of the escheats."[19] The case of Master Peter of Joinzac is perhaps even more typical. This physician, who was for twenty years on the staff of Henry III, first

professional medical servants as part of the retinue or administrative staff had disappeared. The case of Dr. Richard Wiseman (died 1676) is cited. This physician reported that one of his clients had retired "into the country afterwards and returned to London at the end of two years, and acknowledged to me his cure by settling thirty pounds a year upon me during his life and paid me sixty pounds for the two years past."

16 *Year books of Edward II*, Wm. C. Bolland, Ed. Selden Society Publications, XV (London, 1918), pp. 80-82. Herein is recorded a litigation initiated by the physician against the abbot in the year 1313. The claimant charged the abbot with being 20 marks in arrears with his payments.

17 Arderne, *op. cit.*, p. xxii.

18 *Calendar of Patent Rolls*, 1232-1247, p. 167 *et passim*. Cited henceforth as *CPR*.

19 *CPR*, 1247-1258, p. 88.

appears in the records of the year 1235 as recipient of a lifetime grant of one hundred shillings to be collected from the Exchequer annually at Michaelmas.[20] Five years later there appears a confirmation of this grant.[21] In the year 1242 he was in the entourage of his king in Gascony, where the steward was ordered to "let Master Peter, the leech, have forty pounds of Tours (money) in lieu of the ten pounds sterling which were due him at the Exchequer."[22] Later in the same year he was granted 40 pounds of Bordeaux, to be taken yearly in mid-March out of the king's custom so long as he served the king faithfully.[23] In this latter instance, however, it was stipulated that he should give up his hundred-shilling annual pension. Additional letters patent indicate a continuation of this annuity at least until the year 1255.

From Edward I Master Simon of Beauvais, surgeon, regularly received ten pounds per year which was paid to him in the form of a quit-rent by the Abbot of Stratford.[24] Master Pancius de Controne, physician and clerk, and one of the host of Italians who flocked to England in the 14th and 15th centuries as papal envoys, merchants, and professional men, served in the households of both Edward II and Edward III. On 11 November 1317, he was granted 25 pounds *per annum* to be received from the Exchequer at Christmas time "so long as he shall remain within the realm."[25] He appears to have been a member of the royal household continuously from 1317 until his death in 1340, during which tenure he was clerk, attorney, and royal envoy, as well as physician.[26] That he ranked high in royal favor is to be inferred from the numerous grants of money, land, immunities and privileges he enjoyed during his lengthy association with the royal family. A single entry for 2 July 1322 established the eminence of his position:

> Grant for life to the king's clerk and physician, Pancius de Controne, in allowance of the hundred pounds yearly which the king granted to him at the Exchequer so long as he should stay in the realm, and for good service, of the manor of Chiselbergh, co. Somerset, and the manor of Brembelteigh and Lavertye, co. Sussex, . . . and the manor of Plescis, co. Hertford. . .[27]

[20] *CPR*, 1232-1247, p. 113.

[21] *Calendar of Liberate Rolls*, 1226-1240, p. 466. Henceforth cited as *CLR*.

[22] *CPR*, 1232-1247, p. 306; *Roles Gascons*, I, 37.

[23] *CPR*, 1232-1247, p. 320; *Roles Gascons*, I, 56.

[24] *Calendar of Close Rolls*, 1279-1288, pp. 110, 112. Cited henceforth *CCR*. These entries refer to the enrollment of a gift of this rental as well as a tract of land in London by Simon to his son. Both were originally gifts from King Edward to Simon.

[25] *CPR*, 1317-1321, p. 57.

[26] *CPR*, 1324-1327, p. 167; *ibid.*, 1327-1330, p. 390; *ibid.*, 1334-1338, p. 43; *ibid.*, 1338-1340, p. 163.

[27] *Calendar of Fine Rolls*, 1319-1327, p. 137.

After much uncertainty with respect to the collection of his various grants he requested that, instead of the annual 100 pounds from the Exchequer, he be given his yearly salary from the farm of the city of Norwich. This was permitted on 4 June 1333 and was continued until his death in 1340.[28] Master Pancius in his last years made numerous and substantial loans to Edward III. In 1338 the king was in his debt for an amount in excess of four thousand pounds as the result of successive loans.

It is to be emphasized here that these monetary payments, munificent as they sometimes were, actually represented only a portion of the total income of many physicians. Grants from the treasury were more often than not accompanied or supplemented by additional gifts or perquisites. Nor should we overlook the fees from other wealthy patrons with whom the monarch frequently shared his medical staff. When Master Pancius, for example, was permitted through royal intercession in 1320 to ship 80 bags of wool out of England through the port of Southampton *duty free,* we may assume that the immunity made the business venture more profitable.[29] Or when Master Raymond Bariamundo, physician to Queen Eleanor, wife of Henry III, was granted from the king's forest several oaks for firewood and timber, the gift must be calculated as a part of the professional income.[30] It appears conclusive, therefore, that royal physicians, having gained status at court, were extremely well paid and generally occupied positions of political and social prestige.

The fees of other physicians and surgeons, that is, those who were never in the service of royalty, are far more difficult to determine. Their names appear often in the lists of charter witnesses and in tax rolls, but very rarely are their professional fees a matter of record. One may surmise, indeed, from the amount of taxes they paid that they were in many instances men of great means. We judge, chiefly by inference, that there was a great range in the size of fees demanded by these men. Doctors of note such as Gaddesden or Arderne, on whose writings we must lean so heavily, without doubt determined their fees to a considerable degree by the particular economic circumstances of their patients. Some physicians had the good fortune to come to the attention of wealthy patrons. Thus it was possible for a monk of Evroult named Goisbert

[28] *CPR,* 1330-1334, pp. 432, 435. For a careful examination of the financial affairs of Master Pancius see Roger Ellis, "The English lands and revenues of Master Pancio da Controne," *Riv. Storia Sci. med. nat.* 1952, *43,* 267-274.

[29] *CCR,* 1318-1323, p. 195, 255.

[30] *CCR,* 1256-1259, p. 72; *ibid.,* 1259-1261, p. 95.

(d.*ca.*1100) to amass much wealth and therefrom to endow the Benedictine house of St. Evroult. Much of his wealth is said to have come from the practice of medicine, although he was born in Chartres into a family of more than modest holdings.[31] Others appear to have worked for small fees. Master John Gyreberd, summoned to Ledbury in March 1289 to attend Richard Swinefeld, Bishop of Hereford, is known to have charged the churchman six shillings eight pence as his fee and six pence as the fee of his assistant (garcione).[32] Master John de Beauchamp received three marks from the treasury for attending the king's cousin Eleanor in Corfe (Co. Dorset) in the year 1223. A part of this sum, however, was in compensation for the physician's horse which was lost on the return journey from Corfe to London.[33] In 1161 a London physician named Ralph received 14 shillings 3 pence from the Bishop of London, apparently as a medical fee.[34]

Examples of the annuity type of payment from other than royal clients appear infrequently in the records. In the time of King John, there lived in England a physician and writer of note alternately identified as Gilbert of Aquila and Gilbertus Anglicus.[35] For his homage and service to Robert, Earl of Leicester, he received one hundred shillings as annual payment.[36] Then there is the unique case of Master John, a physician, who in 1248 received from Abbot Robert of the Tewkesbury monastery 20 shillings a year from the monastic treasury until such time as he could be more amply provided for.[37]

Among the more lucrative sources of income for the English doctors of this period was the ecclesiastical benefice, or preferment, commonly known as the "living." Feudalism, through its gradual permeation of the medieval Church, wrought sweeping changes in canonical practice. Under Norman administration church lands

31 *Ordericus vitalis historia ecclesiastica,* A. Le Prevost, Ed. (Paris, 1838-1855), II, 402. For Goisbert's presence in England, see my article, "Physicians in medieval English religious houses," *Bull. Hist. Med.,* 1958, *32,* 109.

32 *A roll of the household expenses of Richard of Swinefeld, Bishop of Hereford,* J. Webb, Ed. Camden Society, LIX (1854), pp. 59n, 140n, 151n.

33 *Rotuli litterarum clausarum,* 1204-1224, p. 499b. The cousin of the King here referred to was probably Eleanor, daughter of Goeffrey Plantagenet. She died in Bristol gaol in 1241.

34 *Pipe Rolls,* V, 73.

35 Significant treatments of the identity and life of Gilbert are H. C. Handerson, *Gilbertus Anglicus* (Cleveland, 1918) J. C. Russell, *Dictionary of writers of thirteenth century England* (London, 1936), pp. 38, 39; E. Wickersheimer, *Dictionnaire biographique des médecins en France au moyen age,* (2 vols.) (Paris, 1936), 1, 191, 192; J. F. Payne, "English Medicine in the Anglo Norman period," *Brit. med. J.,* 1904, *2,* 1853-1856.

36 *Rotuli chartarum,* 1199-1216, p. 141.

37 *Annales monastici,* Rev. H. R. Luard, Ed. 5 vols., Rolls Series (London, 1864-1869), I, 317.

and incomes passed by the various infeudation processes into the hands of kings and nobles. The bestowal of private churches, therefore, eventually took the form common to most feudal consignment: investiture with a reciprocal oath, and the transfer of the insignia of office. Church livings such as canonries, prebends, rectories, vicarages, and parsonages, were assigned to categories of honors "owing submission some to the king, some to bishops, some to abbots, and some to lay lords, and subject like all other fiefs to rights of appointment, performance of duties, and fixed payments at a change of occupant or during a vacancy."[38] Thus out of the hands of bishops and abbots and into those of lay proprietors the majority of ecclesiastical appointments were removed. The king and lay proprietors of lesser grade now gave churches and even bishoprics, at the same time investing the recipients with their spiritual *beneficia*.[39] Indeed, so complete was the change that little was left to ecclesiastical authority except the final *transeat* and ratification.

As these changes overspread the *ecclesia Anglicana* many benefices accrued to the monarch himself while his position at the summit of the feudal system made it possible for him to determine the allocation of many others. From such a storehouse of privilege royal physicians were regularly and bountifully provided for, especially after the abuses of pluralism became rife. The evidence as I have examined it leads me to the conclusion, however, that in England at least the awarding of the *beneficium* as a financial provision for physicians was not extensively practised prior to the 13th century. This, I believe, may be explained by the fact that in the 11th and 12th centuries the more celebrated physicians had been members of the regular clergy and as such required no "providing for." While it is true that Ralph Besace, physician to Richard I, became a canon of St. Paul's, the appointment came only after the death of the king and very probably not at his instance.[40] The most eminent physician associated with the household of King John was Adam, Abbot of the Premonstratensian house at Croxton (Co. Leicester).[41] If Matthew Paris' account is to be trusted, it was this physician who came to John after his famous seizure at Swineshead and as he lay dying at Newark. It was Adam who also performed

[38] Dom David Knowles, *The monastic order in England* (Cambridge, 1949), p. 565.

[39] *Ibid.*, p. 566.

[40] *Matthaei Parisiensis historia Anglorum*, F. Madden, Ed. 3 vols., Rolls Series (London, 1866-69), II, 37n; *ibid.*, III, 12*n*. As late as 1243 Ralph was still known as canon.

[41] W. Dugdale, *Monasticon Anglicanum* (London, 1846), vol. 6, pt. 2, p. 876.

the autopsy on the monarch's body.[42] In spite of such conspicuous service Adam does not appear to have received any kind of preferment or award.

Not so distinguished but still high in royal favor was John's physician, Master Matthew. In 1200 he received from his patron a living from Witechurch (Whitchurch, Co. Salop.), a gift over which a lengthy litigation was later to develop.[43] On 6 March 1205, Matthew was once more provided for when the king ordered the Bishop of Carlisle to install the physician in the church of Salekill (probably Salachil, Co. Cumberland).[44] Neither of two other physicians of King John, Master Hamo[45] and Simon of Peregus,[46] is known to have held an ecclesiastical preferment.

It was in the time of the ineffectual and financially harassed Henry III that the benefice system of reward came to be most extensively used in England. Henry's court physician, Master Alexander, was endowed with the prebend of Bridgenorth (Co. Salop) in 1252.[47] Nicholas of Farnham,[48] erstwhile professor of medicine at Bologna and later bishop of Durham, held as gifts of King Henry the churches of Aldenham,[49] Essendon (Co. Hertford),[50] and the chapel of Bayford (Co. Hertford).[51] Another royal physician, Master Peter of Alpibus, was installed as prebendary of St. Clement Chapel in Pontefract Castle in 1241.[52] This appointment was exchanged later in the same year for another at Pontefract,[53] although in the meantime Master Peter had received the church of Wimbledon by a patent letter of 18 July 1241.[54] Master Peter of Joinzac (*vide supra*) on 29 November 1240 was presented with the church of Chipping, which at the moment was in the king's gift because the lands of the Earl of Lincoln were in his hands. This order was directed to the Archbishop

42 *Matthei Parisiensis chronica majora*, Rev. H. R. Luard, Ed. 7 vols., Rolls Series (London, 1872-84), II, 668.

43 *Rot. Chart.*, 1199-1216, p. 99b; *Lancashire pipe rolls and early Lancashire charters*, W. Farrer, Ed. (Liverpool, 1902), pp. 196, 197. See also *Curia Regis Rolls*, 3-5 John, p. 250.

44 *Rotuli litterarum patentium*, 1201-1216, p. 51a.

45 *Rot. lit. claus.*, 1204-1224, pp. 259b, 284a.

46 *Rot. chart.*, 1199-1216, p. 74b.

47 *CPR*, 1247-1258, p. 149.

48 Relatively complete biographical data have been established for Master Nicholas of Farnham. See especially *Dictionary of national biography*, XL, 416-417; J. C. Russell, *Dict. of writers*, pp. 87-89; E. Wickersheimer, *Dict. Biog.*, pp. 569-570; and Etienne Robo, *Medieval Farnham* (Farnham, 1939), pp. 61-65.

49 *Rotuli Hugonis de Welles, Episcopi Lincolniensis, 1209-35*, W. P. W. Phillimore and F. N. Davis, Eds. 4 vols. (London, 1906-1913), I, 137.

50 *CPR*, 1216-1225, p. 328; *ibid.*, 1232-1247, p. 220.

51 *CPR*, 1216-1225, p. 328.

52 *CPR*, 1232-1247, p. 243.

53 *CCR*, 1237-1242, p. 329.

54 *CPR*, 1232-1247, p. 255.

of York.[55] It was just a year later that the physician resigned this benefice. Master Ralph of Necton, another physician of Henry III, held many single church appointments, some of which were issued in order that the "King may be absolved from the payment of fifty marks a year . . ."[56]

A scrutiny of the records discloses a host of physicians outside the royal patronage who received their professional reward through the benefice system. A few selected cases will suffice to illustrate the normal arrangement. A certain Master Alexander, physician, held the prebend of Kilkenny in the diocese of Ossory (Ireland) just prior to the year 1221,[57] while another physician, Master Albinus, was prebendary of the church of St. Cedda, Shrewsbury, at approximately the same time.[58] In neither instance is the name of the patron recorded. Cantorinus, physician to Peter of Aqua Blanca, Bishop of Hereford, was cited in October of 1254 for a benefice worth 50 marks a year "as soon as opportunity offers."[59] Master Elias, *phisicus,* was installed as parson of Ardley (Co. Oxford) around the year 1200, the presentation having been made by Ralph Fitz Robert.[60] Master Hugh Atratus of Evesham, whose medical services were demanded by many prominent persons, held various benefices, some of them from the hands of the king himself.[61] Still another physician, Master John of Leicestershire, was made rector of the church of Staunton-Wyville at the request of the patron of the church, R. de Wyville, knight,[62] while in 1251 Master Peter of Gloucester held the benefices of Brondesburton and Holy Trinity, worth 15 and 8 marks *per annum* respectively.[63] In the same year Master Peter received a dispensation from Pope Innocent IV to hold even a third church appointment.[64] Thus did the widespread practice of pluralism obtain the blessing of the Holy See.

55 *Ibid.*, p. 239.

56 *CLR*, 1226-1240, p. 463.

57 *CPR*, 1216-1225, p. 285.

58 *Ibid.*, p. 441. A patent letter of 1224 records the awarding of this prebend to Albinus' successor. Presumably the physician was dead.

59 *CPR*, 1247-1258, p. 343.

60 *Rot. Hugo de Welles*, II, 7.

61 *Register of Walter Gifford*, W. Brown, Ed. Surtees Society (London, 1904), pp. 57, 58; John Le Neve, *Fasti ecclesiae Anglicana*, 3 vols. (Oxford, 1854), III, 74, 178; *Entries in the papal registries relating to Great Britain and Ireland*, W. H. Bliss *et al.*, Eds. (London, 1894ff) I, 495; *The registry of Walter Gray*, J. Raine, Ed. Surtees Society, LVI (London, 1872), p. 10n; Thomas Tanner, *Bibliotheca Britannica-Hibernica* (London, 1748), p. 418. Hugh's fame was such that he was summoned to Rome in 1279 to consult with the Pope on certain medical problems. (Tanner, *loc. cit.*) He was subsequently commissioned to find a cure for the "fever" which was currently causing such havoc in Rome and throughout the peninsula. (A. Celli-Fraentzel, "Contemporary reports of medieval Roman climate," *Speculum*, 1932, 7, 106.

62 *Rot. Hugo de Welles*, II, 311.

63 *Entries in the papal registers*, I, 273.

64 *Loc. cit.*

Besides the retainer fee and the ecclesiastical appointment medical practitioners benefited in dozens of additional ways. The Domesday Book discloses that William the Conqueror bestowed huge grants of land on certain of his medical advisers, and in the subsequent centuries other wealthy and powerful men gave manors, messuages, and tenements. In some instances these gifts represented vast expenditures. There was the London tenement, "La Ryole," purchased by Edward I for his surgeon, Simon of Beauvais, at a cost of 360 marks.[65] Not uncommon was payment by civil appointment. Such was the case of Thomas of Weseham, eminent surgeon of Henry III, who was appointed to the stewardship of the forest of Cannock in the year 1260,[66] and who later in the same year became the chancellor to the king.[67]

There were payments of other kinds. Gifts of clothing to be received from the king's tailor are matters of frequent record and sometimes of detailed description. Master Crassin, a physician of Henry III, was outfitted with a robe in June 1261 by the gift of the king.[68] On the 20th of September 1254 the king ordered his tailors to give an outfit to Master Hugh of Insula,[69] the physician of Prince Edward. Two years later this physician received a gift of timber.[70] Reimbursement for travel expenses, oak for wood and timber, rabbit fur, squirrel fur, wine, deer, and fish are typical of the tokens of gratitude and payments in kind commonly received by English practitioners. In still another category were the immunities, such as exemption from jury duty and military service, and, as already mentioned, privilege to transport commercial commodities without payment of tax.

It has become apparent, even from the random examples cited in this study, that surgeons were not the recipients of ecclesiastical appointment. My investigation of the sources has revealed not a single instance of a surgeon in holy orders, or for that matter, in ecclesiastical office of any kind. This appears to offer sound support to the oft-reiterated contention that *"ecclesia a sanguine abhorret."* It also lends substance to the widely held notion that surgeons as a professional group did not in the Norman and early Angevin periods of English history enjoy the prestige and respectability of the physicians. Their somewhat inferior status, however, did not

65 *Calendar of charter rolls*, 1257-1300, p. 202.
66 *CCR*, 1259-1261, p. 276.
67 Wickersheimer, *Dict. biog.*, II, 768.
68 *CCR*, 1259-1261, p. 393.
69 *CCR*, 1253-1254, p. 273; Roles Gascons, I, 428.
70 *CCR*, 1254-1256, p. 282.

prevent certain surgeons from receiving handsome rewards, as has been indicated for those in the service of Henry III and Edward I. But as a class the surgeon achieved his professional status slowly and to a large measure through the notable work of such figures as Arderne, William of Saliceto, Henri de Mondeville, Guy de Chauliac, Guido Lanfranchi, and Jan Yperman, all except Saliceto flourishing in the 14th century. Theirs was a respectability to be attained principally through the channels of the university curricula of the late 13th and early 14th centuries. Simultaneously they were sharpening the distinctions between themselves and mere barbers, lifting themselves slowly out of the artisan class.

Two important classes of medieval medical practitioners remain unaccounted for, the monastic physician and the village leech. The income of the medical monk is most elusive. He could hardly have received personal remuneration for his medical skill without violating his holy vow no matter what his order. The monastic scribes are indeed silent on this matter, daring only to hint occasionally that gifts or legacies have come to their houses from the grateful clients of their medical brothers. Yet there is much indirect evidence that monks habitually accepted fees for their medical practice. On at least three occasions in the 12th century church councils examined such practice in the light of church doctrine and canonical law, and at least three times brought forth injunctions forbidding to monks and regular canons the study of medicine "for the purpose of temporal gain."[71] The most direct action was taken by the Council of Tours in 1163, when monks were forbidden both to teach and to practise medicine. In the face of such denunciations and restrictions the absence of monastic medical account books is in no way surprising.

As for the village leech, into whose semi-professional hands must have fallen the bulk of the medical practice prior to the 14th century, we may assume that his income was modest and that his medical work in many instances was not a full-time occupation. His name appears often in attestation of charters and in the rolls of the Exchequer, but the sources are exasperatingly silent on the subject of his wage or fee. It is only through a careful examination of such sparse information as exists relating to the wages of some of the more numerous classes of artisans and a projection of these data

[71] *Sacrorum Conciliorum nova et amplissima collectio*, J. D. Mansi, Ed. (Florence and Venice, 1759-1798), XXI, 438; C. J. Hefele et H. Leclercq, *Histoire des conciles* (Paris, 1907-1921), V, 687.

into the affairs of the leech that we may draw any conclusions as to their incomes.

Lord Beveridge has made two brief but significant studies of wage scales of certain artisan and manual labor groups in a few widely separated localities in England for the period 1250 to 1450.[72] It has been his discovery that carpenters, masons, tilers, threshers, and winnowers in 1250 earned approximately three pence a day, in 1300 an average of 2.8 pence, in 1300 an average of 3.9 pence, and in 1450 an average of 5 pence or better. He discloses also that manual laborers earned only about half as much as skilled craftsmen, and that the city worker earned from 50 to 75 per cent more than the village worker. I believe it is a sound assumption that the earning of the village leech or barber would have compared favorably with that of other artisans, although the nature of his craftsmanship could not have permitted him a day wage such as was possible for other workers. If he was a man respected in his community, and the charter witness lists and tax rolls often indicate that he was,[73] it is logical to assign to him an income equal to that of other skilled workers. Until new sources are uncovered,[74] more can scarcely be said on the subject.

By way of summary, we must somewhat ruefully conclude that Anglo-Saxon literary sources, whether they be the medico-magical texts of the leechbook or the hagio-histories of the chroniclers, shed little light on the problem of medical fees and prices. Nor does the narrative writing of the Norman era yield much more. It is only in the latter part of the Angevin period, when the growing urbanization of Britain had created a climate in which guild or professional organizations could thrive, that medical writers made bold enough to enunciate their economic practices and opinions. For much of the period under consideration in this study, therefore, we have

[72] Considering the use I have made of Lord Beveridge's findings I have deemed it unnecessary to excerpt more than a few general impressions from the somewhat lengthy tabulations he has published. See his "Wages in the Winchester manors," *Econ. Hist. Rev.*, 1936, *7*, 22-43, and "Westminster wages in the manorial era," *Econ. Hist. Rev.*, 1955, *2d ser. 8*, 18-35. In the second study he has examined comparatively wage practices in Westminster, Winchester, and Hinderclay (Co. Suffolk).

[73] My efforts to establish social and economic status for medical practitioners on the basis of the order in which they appear in charter witness lists has produced no valid conclusions. From a casual sampling of some 20 cases it appears that the names of medical men might fall at any place from the beginning to the end of the list. To discover the name of a physician high in a list composed of royal household officers, knights or squires would have significance for the particular case. But to find a physician's name midway in a list of villagers or manorial dwellers would, of course, be meaningless except perhaps to establish his literacy or his general respectability in his community.

[74] In the second article of Lord Beveridge, cited *supra*, mention is made of the recent discovery of an obedientiary account (the Infirmarer's) in the Westminster Abbey archives. It is his opinion that it may throw some light on the remuneration of physicians. This account I have not been able to examine.

leaned heavily upon the gleanings from chancery and exchequer records. While these may have great value in revealing the lives and practices of the physicians and surgeons of eminence and fame, they tell us little of the obscure members of the medical craft.

On documentary evidence alone one is inclined to assign to the medical profession a scale of income of imposing proportions. But the inferences are fairly clear that many a leech never found his way into the official records of the realm, and to this class of practitioners we dare not allot incomes any greater than those of other village artisans. The incomes of surgeons are generally more specifically stated and more discernable than are those of physicians. This I believe may be ascribed to the fact that surgery was almost always a lay occupation, even in the days of the 12th century when the physician's work was largely engrossed by the clergy. The surgeon was freed therefore from the fiction and guile which so often accompanied the collection of fees by the physician, some of which probably lingered on into the 14th century when medicine had become a layman's profession.

Nathan P. Rice's *Trials of a Public Benefactor*

A Commentary

HENRY K. BEECHER* and CHARLOTTE FORD*

IN June 1858 a young physician, Nathan Payson Rice, 29 years of age, who had started practice in New York City a few years before, was asked to undertake the writing of a book. It was hoped that the returns from this book would aid Dr. William T. G. Morton, who had found himself in severe financial straits within a few years after his demonstration (16 October 1846) at the Massachusetts General Hospital of the value of ether as an anesthetic in surgery. More than a decade of almost continuous battle to establish his claim as the principal discoverer of anesthesia and the abortive attempts to obtain a substantial sum from Congress for infringements of his ether patent and in recognition of his services to medicine had proved ruinous. Morton's health was gone, he had lost his dental practice, his "model farm," and whatever fortune he had possessed. Notwithstanding the assistance of friends, including his always loyal supporters at the Massachusetts General Hospital, he was overwhelmed by debt and bedevilled by creditors.

Following another unsuccessful trip to Washington concerning his patent rights, his friends once again rallied to aid him. Support came not only from the medical profession in Boston, but also from physicians in New York, and Philadelphia. They held meetings, brought out an earlier petition to Congress, issued new appeals to the public, and undertook to raise a national fund for Morton's benefit. New York physicians, including Valentine Mott, Marion Sims, and Willard Parker, were among the leaders in this movement, and at a meeting in Parker's house they decided on the publication of a book on Morton and the ether discovery as a means of furthering his cause. After this decision was made, apparently no time was lost in getting started.

Rice had been writing medical articles for books and journals since his arrival in New York to supplement his small income from practice and on 6 June 1858, at the height of the campaign for raising funds, was chosen by Morton to be the author of the book, although previously a stranger to him. Two days later the two

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men drew up an agreement, and Rice shortly began his labors on a unique work. Published as a book of 460 pages, under a title not of his own selection and containing portions of text for which he was not responsible, as he averred, this book was nevertheless destined to bring Rice a degree of immortality in its association with the introduction of surgical anesthesia. Today, a century after publication, *Trials of a Public Benefactor*[1] remains a curious compilation of truths and unsupported text, but indispensable to the early history of anesthesia chiefly because of the letters it contains, and, perhaps also, because of a certain flavor of the period that it conveys.

An account of Rice and his difficulties in dealing with Morton when writing the *Trials* has been given by Viets.[2] According to the original agreement between Morton and himself, Rice was to write a sketch of Morton's life and a history of "the discovery of etherization." Morton was to supply all the materials and be responsible for the statements "personal and otherwise." As the mass of material was too great to take to New York, Rice, who had been endorsed by the committee of physicians interested in the publication of the book as "a gentleman who is fully competent to the task," undertook his writing, at least in part, at Morton's home, presumably Etherton Cottage, at West Needham (now Wellesley), Massachusetts. This could not have been a desirable arrangement, for Morton was hardly the best of companions even under happier circumstances. He was shrewd, suspicious of others, and only too ready to take offense. Above all, he apparently always felt himself to be at a disadvantage in regard to his fragmentary early training, and this probably led to the statement that implied he was a graduate of the Baltimore College of Dental Surgery.

Though Rice was a rapid writer, as Viets has pointed out, he must have worked like a slave during that summer. In twelve weeks he prepared sufficient copy for a book of more than four hundred pages. On 5 August 1858 he had completed the first part of the manuscript and given it to Morton, who paid him $100, and by 1 September the whole book was finished according to the agreement. But between that date and 14 February 1859 when the book was finally offered for sale matters did not progress smoothly. There were various misunderstandings and disputes, extending through

[1] Rice, N. P. *Trials of a public benefactor, as illustrated in the discovery of etherization.* New York, Pudney Russell, 1859. 4 p. *l.*, [v]-xx, [13]-460 pp.

[2] Viets, H. R. "Nathan P. Rice, M.D. and his *Trials of a public benefactor,* New York, 1859." *Bull. Hist. Med.,* 1946, *20,* 232-243.

the autumn of 1858, that resulted in a complete break between author and subject, and Rice became an advocate of Morton's rival, Wells, as having superior claim to the discovery of anesthesia.

Rice's own report of his dealings with Morton is preserved in his handwritten notes in a copy of the *Trials* that he presented to the Harvard Club of New York City (he was a graduate of the Harvard Medical School in 1853).[3] Apparently relations between Rice and Morton were already becoming strained when on 15 September 1858 Rice learned that the manuscript to which he had continued to make additions and alterations during the preceding fortnight to satisfy Morton, had without his permission or knowledge been sent by Morton to his counsel, Richard H. Dana, Jr., for his perusal and opinion. The rift occasioned by this event continued, Morton steadily contributing to it by his difficult attitude toward the later handling of the manuscript. At length, on 16 October 1858, the advance proof-sheets, without copyright, illustrations, or full chapter heads, were issued by the publishers as "Press Copy," (Fig. 1) 500 being printed and 100 bound, the latter being despatched, according to Rice, to "various papers, private individuals and over the country." On 18 October Rice called on Morton in New York, saw a copy of the book and found his own name on the title-page, which he "had never intended." There were additions to the book that were not his, and the title was of Morton's choosing. It seems probable that Holmes was at least indirectly responsible for this selection. In a letter written in Morton's behalf on 30 January 1848, and later published in the *Trials* (pages 286-287), Holmes recommends "what other countries have done for their public benefactors." A portion of this letter had first been printed in *Statements, Supported by Evidence*).[4]

There was further altercation between Morton and Rice, but a new agreement was drawn up, and Rice, who had obtained a copyright for the book on 19 October, was permitted to correct the manuscript. Meanwhile Morton was finding it difficult to secure the money necessary for publication of the book. Later, still other problems appeared, including a proposed lawsuit concerning the

[3] This book was later acquired by the Boston Medical Library, having been withdrawn from the Harvard Club Library in 1923. Perhaps an honor accorded Morton two years earlier had led to its withdrawal. In 1921 a bust of Morton was unveiled at the Hall of Fame of New York University. Dr. William H. Welch represented Medicine at this ceremony, and Dr. Frederic A. Washburn was the delegate of the Massachusetts General Hospital.

[4] *Statements, supported by evidence of Wm. T. G. Morton, M.D., on his claim to the discovery of the anaesthetic properties of ether* . . . Washington, 1853. 582 pp., 11., 135 pp. (p. 178).

delayed payment of a sum promised to Morton. But by then the disillusioned Rice had transferred his copyright and all interest in the book. This was done on condition that the debt Morton owed him for the preparation of the manuscript would be assumed by the publishers. It is not disclosed how much he eventually received

PRESS COPY.

SIR:

WE send you advance proof-sheets, bound, of

"Trials of a Public Benefactor."

We shall publish the same as soon as thoroughly revised, fuller chapter heads supplied, etc.—say November 1.

Please review, and forward us a copy of paper containing the same.

Also insert the accompanying advertisement three times in your Journal, on every other day, the first insertion on the day your notice of the work appears, and send the bill to us.

Respectfully,

PUDNEY & RUSSELL,
79 John-Street, New-York.

FIG. 1.

for his labors in addition to the initial $100 paid him on 5 August 1858, but it is evident that he came to regard his association with Morton as most unfortunate.

Because of the attendant difficulties, the final publication of the *Trials* was threatened as late as January 1859. When it finally appeared in the stores in February of 1859, Rice's request that his name be taken from the book had not been respected. However, he was by then the author of another publication, short it is true, but furnishing ample evidence that his earlier favorable estimate of

Morton had undergone a change. He concedes that Morton was the first to give a public demonstration, but makes it clear that Morton was indebted to Horace Wells for previous knowledge of anesthesia and that in his opinion Wells should be given the principal credit for its introduction. This article,[5] now almost wholly forgotten, attracted at least a certain degree of attention when it appeared. There were references to it in journals which ignored the publication of the *Trials,* and it was mentioned by Chapin A. Harris in his review of the book.

On page 27 of the *Trials* are two statements open to correction. As the first, in relation to Morton's dental training, has often proved a subject of argument, it seems best to digress to refer to it at this point. It is possible that during a brief sojourn in Baltimore in the autumn of 1840 Morton received some private instruction from Horace Hayden, a founder of the newly opened Baltimore College of Dental Surgery. According to Poore,[6] he also attended medical lectures in Baltimore, but by 1841 he was in Hartford where he studied with Horace Wells, later beginning the practice of dentistry at Farmington, Connecticut, a short distance from Hartford. (It may be added that in the winter of 1844 Morton, then in Boston, received some instruction from Dr. Nathan C. Keep, the prominent dentist who became the first dean of the Harvard Dental School, founded in 1867. He also had a brief business association with Keep.) But as Beecher and Ford have noted,[7] most of the accounts of Morton, stemming from the biographies of Rice and his predecessor Poore, contain some reference to his having graduated from the Baltimore College despite an early and emphatic denial by Chapin A. Harris, another founder of the College, as shown in his review of Rice's book published in the *American Journal of Dental Science* (April 1859, *n.s. 9,* 292-293):

> IN calling the attention of our readers to this little book, which is nothing more than an effort to vindicate the claims of Dr. W. J. G. Morton, to the discovery of Etherization, we have no other object in view than to point out and correct the following errors, viz, on page 26 it is stated that the American Society of Dental Surgeons was founded, *"above all to establish dental colleges throughout the United States,"* and that "the first institution of this kind established *under the auspices*[8] of their society" . . . . was the "Baltimore College of Dental Surgery." This is entirely wrong,

[5] Rice, N. P. "A grain of wheat from a bushel of chaff." *The Knickerbocker or New-York Monthly Magazine,* 1859, *53,* 133-138.

[6] Poore, B. P. *Historical materials for the biography of W. T. G. Morton, M.D., discoverer of etherization, with an account of anaesthesia.* Washington, 1856. 114 pp. (p. 6).

[7] Beecher, H. K., and Ford, C. "Some new letters of Horace Wells concerning an historic partnership." *J. Hist. Med.,* 1954, *9,* 9-20 (p. 9).

[8] The italics are our own.—Eds.

the founders of the American Society had no such views. The Baltimore College was chartered by the Legislature of Maryland, during the session of January, 1839-40, six months before the society held its first meeting. (18th of August, 1840.) Indeed, the meeting of the society was not so much as *called*, until three months after the charter had been granted. And, thus it will be perceived, that the Baltimore College has the advantage of priority over all other institutions, (excepting the American Journal of Dental Science), for the advancement of Dental Surgery.

On page 27, the following passage occurs: "During the next eighteen months, he diligently pursued the study of his profession, a portion of the time in Baltimore, the rest at the North. In 1842, *after his graduation*, he formed a co-partnership with Dr. Horace Wells. . . ."

We will not controvert the statement that "during the next eighteen months he diligently pursued the study of his profession," but we deny that the few weeks spent in Baltimore, were devoted to the systematic study of his profession. He was never so much as a matriculant of the College of Dental Surgery, far less did he graduate.

On page 28, the Society of Dental Surgeons is credited with having "established the American Journal of Dental Science." This is incorrect. The Journal was first published in 1839, and was nearly two years old when its management was conveyed over to an editorial committee, appointed by the Society.

On page 29, we find that "it was a habit, at the period of which we write, for *all* dentists, when fitting false teeth, to set them upon gold plate, placed directly upon the fangs of the old teeth, which were never removed." This is so far false, that among the hundred dentists of repute then practicing in the U. S., none were in the habit of applying false teeth in that manner. No manual of dentistry used at this time recommends any such practice.

It appears on page 45, "that, in treating a deformity, consisting of a hare-lip, cleft palate, deficient palatine arch and nasal septum," Dr. Morton employed "*his* new method of sustaining the plates for artificial teeth, namely, atmospheric pressure. . . ." His "new method of atmospheric pressure," as is well known to the profession, was practiced five or six years before, and was not originated by Dr. Morton. In conclusion, we have only to say, that in these remarks we do not wish it to be understood that we have impeached, by implication, Dr. Morton's claims to the honors of having first administered ether, to produce anaesthesia or to his skill as a practical dentist; our only object, as above stated, has been to correct glaring errors. For a more lengthy notice of the "trials," the reader is referred to an article, entitled "A Grain of Wheat in a Bushel of Chaff," in the February number of the "Knickerbocker Magazine."[9]

[9] Chapin A. Harris (1806-1860) appears to have been a somewhat rugged individual who played a leading part in the development of dentistry. Author of an excellent text, *The dental art, a practical treatise on dental surgery* (Baltimore, Armstrong & Berry, 1839, 377 pp.), he was also active in promoting the publication (1839) of the *Amer. J. dent. Sci.*, the first periodical in the field of dental literature. He served as chief editor of this journal for its first ten years and was the sole editor for the next decade, having assumed title and ownership in 1850, which he retained until his death. A native of New York State, he came to Baltimore in the early 1830's after some preliminary medical training and practice in Ohio. He studied under Horace Hayden, the distinguished pioneer dentist (1769-1844) and later assisted Hayden (1839-40) in the founding of the Baltimore College of Dental Surgery, the first institution of its kind. For a further account of Harris and Hayden see: J. B. Robinson, "The foundations of professional dentistry." *Proceedings of the Dental Centenary Celebration*, Baltimore, Waverley Press, Inc., 1940, 1061 pp. (pp. 976-1048).

The disputed passage on page 27 (Fig. 2) concerning Morton's graduation does not occur in the two early versions of the *Trials:* the advance proof-sheets of 16 October 1858 and the first issue which was a more complete book but apparently not widely circulated. This, like the press copy, lacks illustrations but includes the copyright and carries the quotations from Shakespeare and

CHAP. II.] COMMENCES PRACTICE IN BOSTON. 27

with Dr. Haydon, President of the American Society of Dental Surgeons, and a Professor in the new school, and guided by his own proclivities, and the advice given, he decided to commence at once, and perfect himself in this branch of medicine, the practice of which he hoped would furnish him the means of attaining the others. During the next eighteen months, he diligently pursued the study of his profession, a portion of the time in Baltimore, the rest at the North, and in 1842 formed a co-partnership with Dr. Horace Wells, and at once commenced the practice of his new profession at No. 19 Tremont-street, Boston.

The co-partnership between the two not proving so profitable as was anticipated, it was, in the fall of 1843, dissolved. As subsequent events have brought the two partners into a collision of interests, and consequent encounter of claims, it may be as well to show the good feeling which pervaded them, and the cause which really induced their separation. In a letter dated Nov. 22d, 1843, Dr. Wells wrote: "We can both of us see at a glance that it is madness for us to go ahead under present circumstances, for the reason that our receipts will barely pay the cost of materials used, even if we had ever so much work at the prices you have taken those jobs now on hand. * * * *

FIG. 2.

Burns on the title-page (Fig. 3) that appeared in all the subsequent printings of the book. The final version, actually what may be termed the second edition of the book, became the well-known issue, appearing in several varieties of dark cloth bindings, and first offered for sale in the stores on 14 February 1859, as already stated. This contained the full chapter headings in the Table of Contents, in one or two instances corrected and modified, and the various quotations at the beginning of each chapter, presumably selected by some of the "literary gentlemen" Morton employed. (See page 449 of the book.) There are a portrait of Morton as a frontispiece and two illustrations. The portrait is a fine engraving, unsigned, with Morton's signature reproduced. The first illustra-

TRIALS

OF A

PUBLIC BENEFACTOR,

AS ILLUSTRATED IN THE

DISCOVERY OF ETHERIZATION.

BY

NATHAN P. RICE, M. D.

"* * * * * * * * * but there is
No danger in what show of death it makes,
More than the locking up the spirits a time,
To be more fresh reviving—"

SHAKSPEARE.

"What's done we partly may compute,
But know not what resisted."

BURNS.

New-York:

PUBLISHED BY PUDNEY & RUSSELL.

MDCCCLIX.

FIG. 3.

tion, opposite page 63, engraved by G. R. Hall, shows Morton administering ether on a sponge to Eben Frost seated in a chair. Frost, it may be recalled, on 30 September 1846 was the first dental patient Morton anesthetized. The second illustration, opposite page 92, skillfully executed by H. B. Hall, shows Morton giving ether by means of an inhaler to Gilbert Abbott at the Massachusetts General Hospital on 16 October 1846. Seven physicians of the Hospital are grouped about the patient. At Morton's right stands John Collins Warren. This picture, extensively reproduced, especially during the celebration of the centennial of surgical anesthesia in 1946, is doubtless familiar to many who have never read the *Trials*. A third illustration, contained in most copies of the book, is a double page engraving, between pages 218-219, showing the obverse and reverse of the *Prix Montyon* medal, given Morton in 1850 (Fig. 4).

On page 27 of the book, and included in all the issues, is the second erroneous passage which was quoted in part by Harris. In 1842 Morton, it is stated, "formed a co-partnership with Dr. Horace Wells, and at once commenced the practice of his new profession in Boston." This association "not proving so profitable as was anticipated, it was, in the fall of 1843, dissolved." Actually, their office in Boston was not opened until 21 October 1843, and the partnership continued, in name at least, until October 1844. On the 24th of that month the *Boston Daily Atlas* published the notice that "the co-partnership of Wells & Morton has been dissolved by mutual consent." On 2 November Wells wrote Morton the following letter (Fig. 5):[10]

Hartford Nov 2, 1844

Dear Sir

Your letter has just come to hand containing the advertiseing bills—and a dissolution notice—I advertised our dissolution last week in the Boston Atlas which I suppose will be sufficient—

In regard to those notes you are doubtless aware that the last one becomes due next Monday the 4th of Nov—When you were last here you said the note which was due 3 months since would be paid in the fall when you came on—The fall is past and that remains unpaid and the other will be due day after tomorrow—This is to enquire if you will be ready to meet them if I send them on by the express—I am now in want of money and you must try to furnish me with it—Please to answer by the next mail without fail

Yours

H. WELLS

[10] This was acquired a few years after the Beecher and Ford account of the partnership had been published (1954).

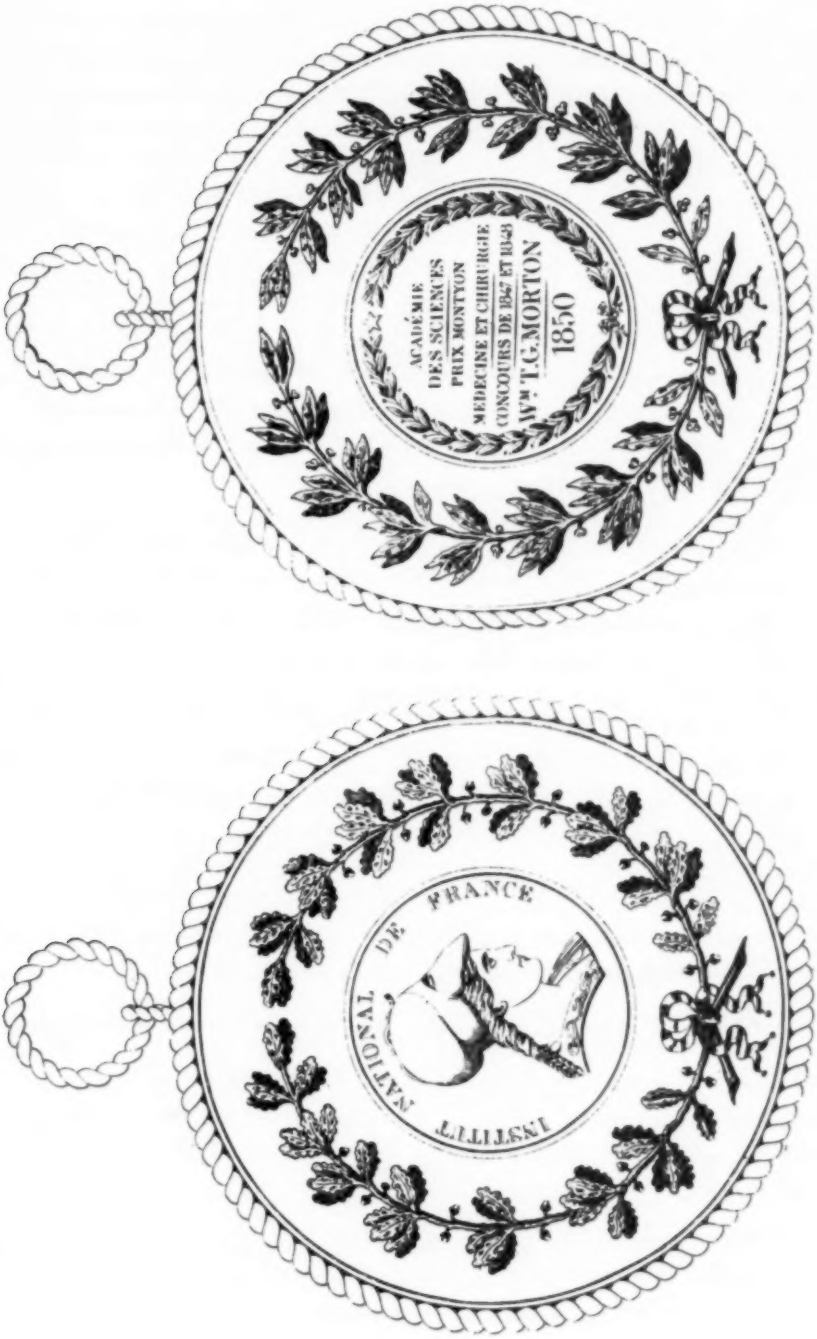
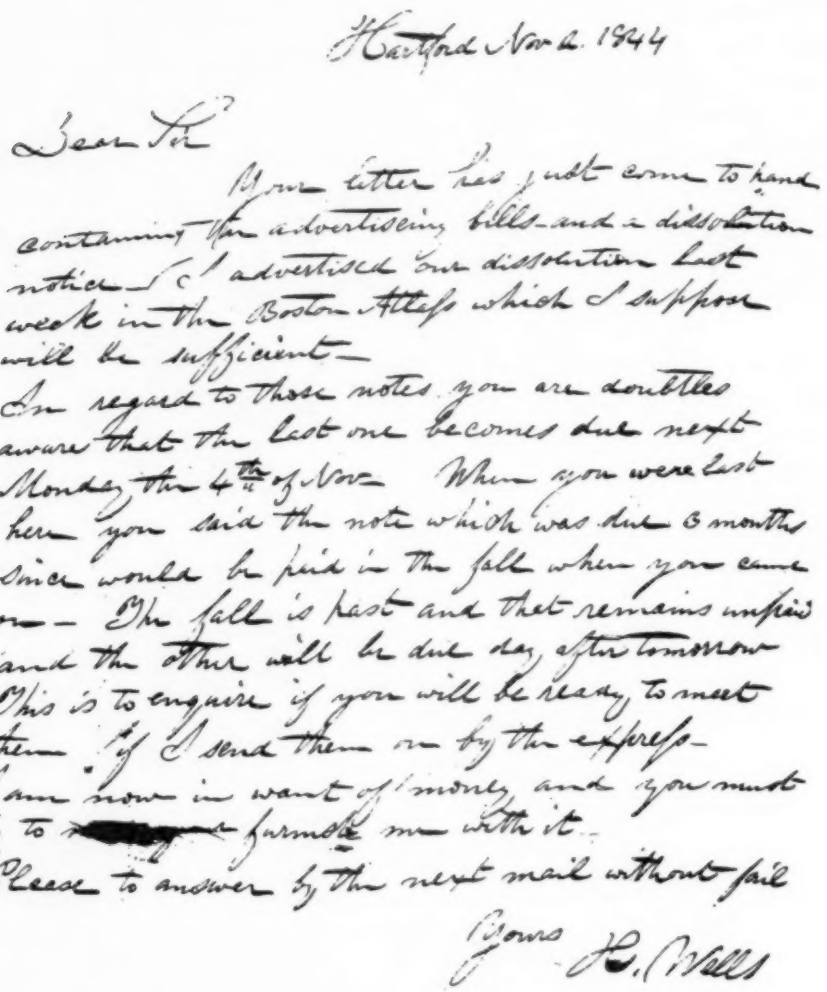

ACADÉMIE
DES SCIENCES
PRIX MONTYON
MÉDECINE ET CHIRURGIE
CONCOURS DE 1847 ET 1848
Wm T.G.MORTON
1850
NATIONAL DE FRANCE
INSTITUT

FIG. 4.

Six weeks after despatching this letter Wells made his discovery (10 December 1844) concerning the anesthetic effects of nitrous oxide. If given to speculation, one could perhaps write a rich chapter on "the might have been" in the history of anesthesia had Wells



Hartford Nov 2. 1844

Dear Sir

Your letter has just come to hand containing the advertising bills and a dissolution notice &c I advertised our dissolution last week in the Boston Atlas which I suppose will be sufficient—

In regard to those notes you are doubtless aware that the last one becomes due next Monday the 4th of Nov— When you were last here you said the note which was due 3 months since would be paid in the fall when you came on— The fall is past and that remains unpaid and the other will be due day after tomorrow This is to enquire if you will be ready to meet them. If I send them on by the express— I am now in want of money and you must try to [redacted] furnish me with it.

Please to answer by the next mail without fail

Yours H. Wells

FIG. 5.

and Morton continued their partnership in one form or another. In the light of subsequent events, it would appear that probably nothing could have proved more unfortunate to the future lives of these two men than their estrangement.

Following his demonstration at the Massachusetts General Hospital in October 1846, Morton, in conjunction with Dr. Charles T.

Jackson, one of his former medical preceptors and advisers, applied for his ether patent, this being received on 12 November 1846. (Owing to the circumstance that the official seal of the U. S. Patent Office was not affixed until 12 February 1847, the document did not become publicly available until after that date.) Morton, however, as early as November 1846 had begun to employ various agents to dispose of his patent rights and to extend the knowledge of the ether discovery. Chief among these agents was Edward Warren, later identified with the publication of the famous Letheon pamphlets. Warren was referred to in the *Trials* as the nephew of John Collins Warren. This was incorrect, but he figured prominently for a time in promoting Morton's interests.

As a first step in submitting his case to the Government with his claim for recognition as discoverer and for an award, Morton sent Edward Warren to Washington to present a memorial to Congress. This, it is stated in the *Trials* (page 222), he was able to do on 28 December 1846, notwithstanding the fact that the "Dental Manifesto," a formal protest against the use of ether emanating from a group of Boston dentists, had been published earlier in December and widely distributed. But following the appointment of a select committee of the House of Representatives to investigate Morton's claim, the Honorable James Dixon of Connecticut protested against a decision in Morton's favor as the discoverer of anesthesia until he (Dixon) had opportunity to present Wells' claims. Wells, then in Paris, had published[11] a popular account of his discovery in the news sheet, *Galignani's Messenger*, on 17 February 1847. This was reprinted in English in the Boston *Atlas* of 2 April 1847. In May of that year the General Assembly of the State of Connecticut passed resolutions giving Wells the credit for the discovery of anesthesia. Eight months later (January 1848), his suicide as a broken man at the age of thirty-three aroused sentiment against Morton.

Proceedings at Washington continued, the staff of the Massachusetts General Hospital often lending its active support, but the now estranged Jackson had not remained idle and pressed his own claims to the discovery. This constituted a further serious factor in the controversy. On Morton's side there were letters, petitions, and testimonials signed by many leading members of the medical

[11] A first attempt to establish priority as discoverer was his letter that appeared in the *Hartford Courant* of 9 December 1846. For a further account of Wells's publications, including his other French claims, also a full description of the publications of Morton, and his agent Edward Warren, in the Letheon series, see the following: Fulton, J. F., and Stanton, M. E. *The centennial of surgical anesthesia. An annotated catalogue.* New York, Henry Schuman, 1946. xv, 102 pp.

profession and other distinguished individuals; nevertheless, little was accomplished. In 1854 Crawford W. Long's claim to the initial employment of ether in surgery was officially presented. Two years earlier, on 28 August 1852, a heavy blow had been dealt Morton's cause when, during a heated debate in the Senate, Truman Smith, Senator from Connecticut and a strong Wells partisan and attorney for Mrs. Wells, termed a proposed award of $100,000 to Morton an "attempt to filch money from the Treasury" and "an outrage upon the rights of others." Later Smith, through continued opposition and some of his own publications,[12,13] was largely responsible for the final defeat of Morton's efforts to obtain Congressional recognition which had extended over a period of more than fifteen years.

In any long-range consideration of the *Trials* and its shortcomings, due allowance should perhaps be made for the haste with which the book was composed. Morton, as Rice implied, was at least figuratively always at his elbow. He feared the appearance of some opposition book, as he later told his publishers. The book lacks an index, and there are other errors beside those already noted, including the irregular numbering of the preliminary pages. Certain portions of Poore's *Historical Materials* are contained in it, as well as a selection of material previously printed in *Statements, Supported by Evidence.* Some of the published letters, including the famous one of Holmes (page 137) suggesting the employment of the words "anaesthesia" and "anaesthetic" had first appeared in Warren's Letheon series.

The book, as might be expected, is repetitious, especially in those portions of the narrative which deal with the ether controversy. The discrediting of Wells with Morton remaining heroic is a feature that Rice, as indicated, sought to amend following his break with Morton.

The *Boston Medical and Surgical Journal* was evidently disposed to see the *Trials* in a favorable light and on 28 April 1859 published a review from which we quote:

> We do not propose to open our pages to the discussion of a subject which has been brought so often before the profession and the public. We have our own opinions on the merits of the controversy, but we do not conceive that the promulgation of them at the present time would be of interest to our readers, or of benefit to the one whom we consider to be the rightful claimant. [Wells?] We will only say that Dr. Rice's arguments

12 Smith, Truman. *An examination of the question of anaesthesia, arising on the memorial of Charles Thomas Wells, presented to the United States Senate, second session, thirty-second Congress . . .* New-York, J. A. Gray, 1859. viii, [5]—154 pp.

13 Smith, Truman. *Anaesthesia! The greatest discovery of the age! Who is entitled to the credit of it?* [New York, 1859?] 16 pp.

appear to be forcible, and to be supported by adequate evidence; but of their value, the reader must judge.

To all who are interested in the subject of the great blessing of anaesthesia, we heartily recommend the work. It will be read with all the interest of a romance. Whichever side the reader may espouse, he will hardly pause till he has read the book through. We are sure it will find readers enough.

The truth of this last pronouncement of the *Journal* has apparently been amply demonstrated through the ten decades following its publication. Although there has been an increasing tendency in recent years to question some of the book's statements, the *Trials of a Public Benefactor* has long been regarded as standard source material by those aspiring to write any account of William T. G. Morton and the discovery of anesthesia, and it seems probable that it will retain this status.

Jean Astruc (1684-1766):
A Biographical and Bibliographical Study

JANET DOE*

TO see a man in the right perspective, he needs to be placed against the background of his period. Jean Astruc, whose 82 years extended from late in the 17th century to well past the middle of the 18th, was in many ways a characteristic exponent of his era, rather than a figure standing out from it. Vast had been the discoveries of the century preceding his birth, embracing the work of such men as Harvey, Sydenham, Leeuwenhoek, Malpighi, Descartes, Kepler, Boyle, Mayow, Sylvius, and culminating in the revolutionary concepts of Galileo and Newton. Men needed time to assimilate this mass of new ideas. The methods of research were establishing a new order based on inductive reasoning and universal laws instead of on speculation and theorizing. Small wonder that many minds in the beginning of the succeeding century occupied themselves in attempts at systematizing this knowledge and in consolidating the advances which had followed so rapidly on each other. In medicine this tendency resulted in the laborious endeavors of the encyclopedists.

Yet the first half of the 18th century saw continuing, if lesser, progress in science, too. Winslow's textbook of anatomy, 1732, exercised tremendous influence, as did Albinus' beautifully illustrated folios. Linnaeus published his epoch-making *Systema naturae* in 1735. Réaumur produced his thermometer in 1731. Stephen Hales' *Statical Essays* contained in its second volume, "Haemastaticks," 1733, the first quantitative estimates of blood-pressure and studied the pulse, heart capacity, and blood velocity. Friedrich Hoffmann based his mechanistic system of medicine on reasoning and observation, but enlightened by the new findings in chemistry and anatomy. In the clinical field Boerhaave overshadowed all others, being not only the perfect systematist, arranging the problems of nature in logical sequence, but being also the first of the clinicians to bring the patient back to the center of attention. His influence extended through his pupils to Vienna, Germany, England, Scotland, and America. His wisdom applied the Hippocratic principles to the study and practice of medicine.

* Library Consultant, New York Academy of Medicine, New York City.

Jean Senac, the important French clinician, produced a book on the structure of the heart, 1749, which is a classic for its precise observations of symptoms and lesions. In surgery, de la Peyronie of Montpellier, procured the definite separation of surgeons from barbers and founded the Académie Royale de Chirurgie in 1731, while Jean Louis Petit became the most eminent surgeon of the first half of this century and the greatest contributor to his subject in France since Paré. In the field of obstetrics, the French produced the greatest masters, among them Nicolas Puzos and André Levret, and students came to the French schools from all parts of the world.

The second half of the 18th century, up to the time of Astruc's death in 1766, saw the greatest advances in pathological anatomy and the laying of the scientific basis for modern medicine in Morgagni's masterpiece, *De sedibus et causis morborum*, published in 1761 when its author was 79 years old. In this he combined in systematic fashion the special knowledge gained in the autopsy room with his careful clinical observation, linking physical changes firmly with symptoms and diseases. Similar modernization in the field of physiology was accomplished by Boerhaave's student, Haller, whose genius outreached the talents of his teacher. His trailblazing researches on the physiology of muscle and nerves were consolidated in his classic *Elementa physiologiae corporis humani*, 1759-1766, which made physiology into a modern discipline, while his smaller *Primae lineae physiologiae* became the standard textbook for decades.

This spirit of modernity, manifested so eminently in Morgagni and Haller, seems to have arrived too late to affect Astruc's outlook, however, which remained that of the consolidationists of the first half of the 18th century. His insight and his prodigious activity were directed backward, on the whole, rather than forward. He delighted in gathering all that had been said by the writers of the past on a particular subject, sorting, arranging, and reinforcing established ideas. While his mind was not closed to new currents, these met in him with no avid welcome. Whether it was because of lack of interest or of courage, one can only guess. Though he was mainly occupied with the ideas of his predecessors, he was at the same time a careful observer of present facts. Unfortunately, the two processes of thought seem seldom to have fermented in his brain into new hypotheses. He was content for the most part to read the records of the past, to teach his students, and to build up a lucrative practice.

Born on 19 March 1684 at Sauve, a large town in lower Languedoc, Jean Astruc was the child of Pierre Astruc (rather than Jacques), a Protestant pastor who went over to Catholicism shortly before the revocation of the Edict of Nantes 1685. The son was brought up in the Catholic faith and was never known as anything but a Catholic, though modern biographers believe his ancestry was Jewish. The name, Astruc, was frequently used by Jews in southern France and eastern Spain, and there have been many Jewish Astrucs in Languedoc and specifically in Sauve, according to Friedenwald. The latter thinks that Jean Astruc was aware of his ancestry, a fact which would add interest to his account of Jewish physicians in his history of the Montpellier Faculty of Medicine. Moreau also states that Astruc was of Jewish origin, as does Delaunay.

Astruc's father, leaving the ministry for law, gave his whole interest to educating his two sons. With a large library, an exact knowledge of the sacred languages, and the study of antiquities as his province, he was well fitted to give his children the beginnings of that erudition for which Jean became famous. During the boys' early years, they had no other preceptor than their father, and the excellence of their training is evidenced by Jean's ability to take his master of arts degree at the University of Montpellier in 1700 at the age of 16, whence he proceeded to a doctorate there in 1703. He must have been an apt pupil, for his professor, Pierre Chirac, when called to the wars, had him appointed to teach in his place for the years 1707 to 1709, and in the next year Astruc obtained the chair of anatomy at the neighboring University of Toulouse.

The years between his graduation and his first professorial appointment were a time of intense personal preparation for the career of teaching and study which his ambition laid down for him. An immense amount of industry and observation went into them. He read all the ancient and modern authors, carefully analyzing their works, picking out from each one his special contributions to knowledge, weighing each against the other to estimate their authority. By so doing he secured that familiarity with the history and literature of medicine which formed the solid foundation of his clinical writings and established his reputation for learning.

The library he gradually acquired for himself amounted to 3,544 volumes when it came to be listed after his death, an unusual collection for a practitioner of his day. Unusual, too, was the catholicity of subject matter included in it: not only was medicine well represented, but there were hundreds of volumes on theology,

law, science and arts, belles lettres, history, geography, rhetoric, geometry. As the Count de Rochefort remarked in his memoirs, "He knew everything, they said, even medicine!"

Undoubtedly out of this wide reading began the extraordinary breadth of interests which produced the many-sided individual Astruc became. His thesis had been on the cause of effervescence. Chemistry led him to a memoir on the "intercalation of the fountain at Font-Storbe," and the next year he was conjecturing on the straightening of plants inclined to the horizon, and after that on the "petrifications" in a village near Montpellier. The mechanics of Boyle, Bellini, and Borelli intrigued him: he was one of the first teachers to use mathematical demonstrations in explaining body physics, and in 1710 he wrote a dissertation on muscular motion. Another memoir in the same year inquired into the cause of digestion, was enlarged into a treatise in 1714 and started thereby a protracted controversy with the Scot, Archibald Pitcairn, and Astruc's own countryman, Philippe Hecquet—throughout which, by the way, Astruc conducted himself with more dignity and restraint than did his opponents.

His heart was set on success as a teacher, however, and with his appointment in 1717 to the chair of medicine at Montpellier began his formal professorial career which was to end only with his death. A real teacher by taste and by nature, he devised a method of presenting his subject to students which was so simple, so methodical, so reasonable, that they could take it down easily in syllabus form, while his eloquence was such that they carried in their minds the mass of detail to be filled in later.

At Montpellier, besides teaching, Astruc published several dissertations on theses at which he presided, showing the continuing variety of his mental activity: on fistula of the anus; on the mechanism of the brain; on sugar as food; on hydrophobia—in which his display of erudition was both amusing and instructive; on sensation; and on imagination. The connection between the soul and the body was one of his keen concerns throughout life: he intended eventually to produce a major work on it to be entitled "De animastica," and it never ceased to occupy his thoughts. So notable a reputation had Astruc acquired by 1720 that a royal pension of 700 livres was granted him, unsolicited, and he was appointed inspector of mineral waters for Languedoc.

Meanwhile, plague was raging along the Mediterranean. Astruc pronounced it contagious and advised on means of controlling it. But the learned men of the University overruled him, calling con-

tagion a chimera raised by fright, and continued with happy temerity to allow the world and themselves to be exposed to plague. Astruc's dissertations on the plague in Provence, on the origin of epidemic diseases, and on the contagiousness of plague showed an exact historical knowledge, a developed reasoning, and a forceful maturity which unfortunately failed to accomplish their end.

Astruc was now writing a good deal, and he had more ambitious themes in prospect: his work on venereal diseases and his history of the Faculty of Medicine at Montpellier were both simmering, and both required access to larger literary facilities than Montpellier afforded. He felt he must go to Paris and in 1728 he went. Peaceful study was not immediately available there, however: the King of Poland called him to be first physician in 1729, a post which Astruc relinquished in a year; and the city of Toulouse made him its Municipal Officer, a flattering attention, even though Astruc's Paris residence rendered him of no use to Toulouse. Appointed consulting physician to the French King, Louis XV, in 1730, Astruc was in a position to accept his heart's desire when chance gave it to him soon after: he was named to the chair of medicine at the Collège Royal. At last he was teaching in Paris. And how he taught! He explained in Latin all diseases and their methods of treatment in great detail. Always on time, he spoke for the entire hour with a facility and method seldom seen. He made no preparation: he could talk as well on any topic raised as on the given one, showing an unequalled historical background and critical power. He loved it! And besides teaching, he practised medicine. His name was so revered that miracles were expected.

At long last, in 1736, his first major publication—one of the reasons for his coming to Paris—appeared, the *De morbis venereis,* and it was an immediate success. In spite of his confusing syphilis and gonorrhoea—as did everyone else for another hundred years—he did clear the field of much of the charlatanism and ignorance which had existed previously, and his history of syphilis, the result of long and painstaking research, was a prodigy of wide reading and reasoning. The book became authoritative almost at once, subsequently going through many editions and being translated into French, English, German, and Spanish.

With all his teaching, writing, and practice, Astruc still found time to indulge his taste for natural history and antiquities. In 1737 appeared his *Mémoires pour l'histoire naturelle de la province de Languedoc,* in three parts and adorned with engravings, the result of his long study of the Roman remains in Languedoc, the

origins of the language, changes of family names and place names, the soil, the terrain covered by the sea, the mineral waters and subterranean streams. He had obviously not regarded his post of inspector of the waters as a sinecure.

During this year of 1737 and the next, a heated controversy raged between the surgeons and the Paris Faculty of Medicine, and although Astruc was not a member of the Faculty, he placed the weight of his learning, reputation, and eloquence on their side—with, it is said, more spirit than reason. Be that as it may, this undoubtedly had much to do with Astruc's eventual admission to their fellowship. Many of the members of the Faculty were his friends and he was eager to become their colleague. His unanimous co-optation into its bosom in 1743 was a rare event: his biographer, Lorry, compared it to the honorary citizenship granted to Greek heroes! Strangely enough, he presented before the special commissioners of the occasion the identical dissertation he had given seven years previously when presiding at the examination of a now unknown candidate on 17 October 1736: "An sympathia partium a certa nervorum positura in sensorio interno." He must have been hard pressed for time not to have brought forth something original for this moment. But Astruc had at last achieved the goal of his dreams, to be no longer regarded as a provincial outsider but accepted by the Faculty as one of themselves. Never did a physician bear a more tender feeling for his professional body: Astruc rarely failed to be present for the smallest action or meeting to the end of his life; he visited regularly his appointed sick poor every Saturday.

Through all this, his teaching never stopped. It was probably his pupils who were responsible to a large extent for the spread of his fame through Europe. Those methodical lectures of his, taken down so easily and reconstructed with such scant trouble, were circulated among students in many universities. Lorry tells of such a manuscript on physiology still well thought of in the schools as late as 1767 (though it could hardly have survived long after the advent everywhere of Haller's *Primae lineae*). Another, *Tractatus therapeuticus*, was audaciously published under Astruc's name at Geneva in 1743 by a physician, La Motte, and though disavowed by Astruc, it continued to appear for thirty years in many editions. Another compilation appearing in the same year at Geneva, *Tractatus pathologicus*, was recognized by Astruc to be his own teaching, and it, too, continued to be reissued at intervals, the last edition in 1767 (in its turn doubtless nullified by the new ideas of Morgagni).

The same situation was meanwhile arising in London. There, in 1743, it was Astruc's gynecological instruction which was being boldly published under his name, *A Treatise on All the Diseases incident to Women . . . Translated from a Manuscript Copy of the Author's Lectures Read at Paris, 1740.* Astruc was astounded and flattered that the English accepted with so much warmth the work of a foreigner and a Frenchman, but he objected to the furtiveness of the publication and resolved to compose a proper treatise on the subject himself. This project was spread over the years, since he stopped during the process to publish a *Traité des tumeurs et des ulcères* in 1759, as well as having other irons in the fire; but in 1761 appeared four volumes of his *Traité des maladies des femmes,* to be followed in 1765 by two more, and in 1766 by what he regarded as a seventh volume, his *L'Art d'accoucher,* which, as a manual for midwives, supplied the obstetrical information previously wanting.

This last volume's preface throws considerable light on our author's mental attitudes and methods of procedure. Here he informs the reader—in a manual of obstetrics, remember—that he has never delivered a child, but having been charged by the Faculty in 1745 to give a course for midwives (which was still continuing), he had read all the treatises on obstetrics which had appeared in Latin or French during the previous 30 years and had extracted from them what seemed "best and most authorized." These lectures had been improved through the years, and when the Faculty asked to have them written down for midwives outside Paris, he had done this, considering that they would fill a gap in his larger treatise. This book on the diseases of women, while it went through several editions and translations, did not receive the acclaim accorded to Astruc's book on venereal diseases, even meeting with some tactfully expressed objections.

Those unauthorized treatises of 1743 were not the only ones issued thus under Astruc's name. They succeeded so well in England that two others along the same lines were published shortly thereafter in London: *A General and Compleat Treatise on All the Diseases incident to Children,* 1746, and *Academical Lectures on Fevers,* 1747. Since there is no evidence that these books had French or Latin editions, it is probable that Astruc was too busy to take note of them, if indeed they ever came to his attention. The systematic structure of these lectures, progressing regularly from symptoms to diagnosis to prognosis to therapy, follows the pattern of the earlier unauthorized treatises, as does that of several French manuscripts of his lectures. The University of Toulouse has one

such, "Traité des tumeurs expliqué l'an 1736." Another was listed recently in a bookseller's catalogue, "Traité du scorbut," undated. The Osler Library of McGill University has four manuscripts in two volumes, written presumably by students chiefly between 1746 and 1748 and dealing respectively with diseases of the lower abdomen, with several special diseases, and with diseases of the chest, the latter in two versions. Still a third version on the chest, undated, exists in manuscript at the University of Chicago, signed by N. Coillot. This same pupil is responsible for a manuscript at Cornell University, dated 1762, entitled "Traité des maladies des vieillards."*

In addition to his major clinical works, Astruc found time to publish a number of smaller medical papers through these later years, but his publications of note lay outside his teaching field. In 1753 appeared anonymously his famous *Conjectures* on the sources of the book of Genesis, in which he furnished the first clue to the separation of the combined accounts by their use of different Hebraic names for the Deity. Designated by religious historians as "the foundations of Old Testament criticism," this work has been placed by Osler in his "Bibliotheca Prima" as part of the essential literature of science. Perhaps to offset the unfavorable reaction to this work, Astruc wrote two years later a dissertation on immortality and another on the immateriality and liberty of the soul.

His last writing of importance he did not live to see published, although he had worked at it off and on throughout his busy life: his scholarly history of the Faculty of Medicine of Montpellier. Edited and brought out posthumously by A. C. Lorry, it is a monument to its author's careful and loving labor in preserving the record of medicine at his University.

Astruc's death on 5 May 1766 came in the midst of his endeavors at his desk with pen in hand. Most of his 82 years had been spent in hard work for his profession, in teaching, in controversy, in studious research. Whether he did it because of a genuine affection for medicine and his colleagues or because of personal ambition, it is hard to say. Certainly it was only accomplished through indefatigable industry, the constant neglect of his family life (he had married Jeanne Chaunel, of good family, and had a son and a daughter), and the sacrifice of all personal amusements. And he made enemies as well as friends. Counter to the eulogistic attitude of many of his biographers may be cited the opinions of some of the

* Discussed by Dr. Frederic D. Zeman at the meeting of the New York Society for the History of Medicine, October 1950.

less friendly ones. Grimm is quoted by Lantour as saying that although Astruc was a learned physician, he was a poor practitioner, thinking always of his purse and his daughter's prospects. Lantour himself, a contemporary, raised eyebrows over Astruc's relations with a lady from whom he received large sums of money, and averred at Astruc's death that he was one of the most decried men in Paris, passing for a knave and a cheat, violent and passionate, full of sordid avarice.

Fiessinger, a modern writer, makes the quip that Astruc "hesitated sometimes to disengage his medical advice from the baggage of erudition he carried with him: he knew so many things." His claim to fame, says this writer, lies in the fact that he was not afraid to try new things and to get others to try them. His fault lay in not daring to use the richness of his imagination; he feared to be ranged among those who make hypotheses. He had not the courage to make a choice between two interpretations of facts: he preferred to wallow in the facts.

Chaussier portrays Astruc as lacking the breadth of view which leads to a profound philosophy of medicine, both in his theories and in his practical judgment of a patient. Instead, he is shown as a physician gifted with a prodigious memory, a good mind, but cold and with small powers of invention, more capable of receiving a suggestion than of making one; who contributed nothing to the happy Hippocratic revolution then permeating medicine; who did not pass for a good practitioner because he usually let nature take her course; but who, by the order he established in his vast works of erudition, should serve as a model to those who aspire to the same sort of success.

ASTRUC'S WRITINGS

Because none of the biographical sources consulted gave a comprehensive record of Astruc's writings, a list—not intended as an exhaustive one—has been compiled here from those sources supplemented by library catalogues and by direct communication with a few libraries: the Bibliothèque Nationale; the British Museum; the Faculty of Medicine of Paris; the Library of Congress' Union Catalog; McGill University's Osler Library; the U. S. National Library of Medicine; the New York Academy of Medicine; the Toulouse Municipal Library; Tulane University; the University of Chicago; the University of Ghent; the University of Montpellier; the University of Toulouse; the Wellcome Historical Medical Library; the Yale Medical Library. To all of these libraries go my warm thanks for their help. Titles found only in a biographical account and not

reported by any library are indicated by the word "Citation" following their entries.

The arrangement of the list follows the broad subjects covered by Astruc's interests:

A. Anatomy & Physiology (1-12)
B. Diseases: Pathology & Therapeutics (13-40)
C. Contagious Diseases (41-49)
D. Venereal Diseases (50-73)
E. Gynecology (74-86)
F. Obstetrics (87-94)
G. Tumors (95-102)
H. Psychology and Neurology (103-112)
I. Controversy with the Surgeons (113-118)
J. Natural History (119-126)
K. History (127-128)
L. Religion (129-131)
M. Miscellaneous (132-135)

Under the topics, titles are arranged chronologically by date of the first edition of each, with their subsequent editions immediately following this.

A. ANATOMY AND PHYSIOLOGY

1. Brevis responsio criticis animadversionibus Francisci Renati Vieussens in Tractatum de causa motus fermentativi. Montpellier, 1702. 9 pp.
2. Tractatus de motus fermentativi causa, novam et mechanicam hypothesim continens. Montpellier, 1702. 177 pp.
3. Responsio ad secundam animadversionem in Tractatum de causa motus fermentativi. Montpellier, 1703. 8 pp.
4. Sur la route des urines. In: *Histoire de la Société Royale de Montpellier* [for 1707], 1766, vol. I, pp. 91-96.
5. Dissertatio physico-anatomica de motu musculari. (*Praes.* J. Astruc.) Montpellier, 1710. 189 pp. (Respondent: Joannes Diego.)
6. Mémoire sur la cause de la digestion des alimens. In: *Mémoires de la Société Royale de Montpellier* [for 1710], 1766, vol. I, pp. 145-166.
7. *Idem.* [Montpellier, 1711.] 24 pp.
8. Traité de la cause de la digestion. Toulouse, 1714. 400 pp.
9. Epistolae . . . ad . . . D. N. . . . quibus respondetur epistolari Dissertationi Thomae Boeri de causa concoctionis. [Toulouse, 1715.] 75 pp.
10. Disputatio in haec verba E. Saccharum alimentum. (*Praes.* J. Astruc.) Paris, 1719. *Citation.* (Respondent not given.)

10a. An saccharum alimentum? (*Praes.* J. Astruc.) [Paris? 1759.] 4 pp. (Respondent: Stephanus Dhuaume.)

11. Quaestio medica, An ex anatome subtiliore ars medica certior? (*Praes.* J. Astruc.) 1743. In: G. F. Sigwart. *Quaestiones medicae parisinae.* Tübingen, 1760, vol. 1, pp. 220-228. (Respondent: Claudius Bourdier de la Moulière.)
12. *Idem.* In: G. F. Sigwart. *Quaestiones medicae parisinae.* Tübingen, 1789, vol. 1, vol. 1, pp. 220-228.

B. DISEASES: PATHOLOGY AND THERAPEUTICS

13. Quaestio medico-chirurgica . . . An fistulis ani chirurgica sectio? (*Praes.* J. Astruc.) Montpellier, 1718. 52 pp. (Respondent: Franciscus Texier.)
14. Dissertatio medica de hydrophobia. (*Praes.* J. Astruc.) Montpellier, 1719. 94 pp. (Respondent: Josephus Bardon.)
15. *Idem.* 1720. *Citation.*
16. A treatise on the fistula of the anus. London, 1738. 199 pp.
17. Tractatus pathologicus. Geneva, 1743. 232 pp. [Issued from notes taken at Astruc's lectures.]
18. *Idem.* Geneva, 1745. *Citation.*
19. *Idem.* 3.ed. Geneva, 1753. 232 pp.
20. *Idem.* Geneva, 1766. *Citation.*
21. *Idem.* 4.ed. Paris, 1767. 299 pp.
22. Tractatus therapeuticus. Geneva, 1743. 480 pp. [Issued by La Motte and repudiated by Astruc.]

23. *Idem.* Venice, 1748. 260 pp.
24. *Idem.* 2.ed. Geneva, 1750. 383 pp.
25. *Idem.* Geneva, 1753. *Citation.*
26. *Idem.* Geneva, 1773. *Citation.*
27. Traité thérapeutique. 1755. This translation of the *Tractatus therapeuticus* by Isaac Garcelon was suppressed by the Collège des Médecins de Bordeaux because of the changes made by the ignorant translator (Dezeimeris).
28. A general and compleat treatise on all the diseases incident to children. London, 1746. 229 pp. [Issued from student's lecture notes.]
28a. Traité des maladies qui attaquent les parties contenantes dans la poitrine et celle de la gorge. Des maladies du bas-ventre. [n.p., n.d.] 2 vols. continuously paginated (784 pp.) MS. (at Yale Historical Medical Library).
29. Traité des maladies du bas ventre . . . [n.p.], 1746-48. 4 pts. in 2 vols. MS. (at McGill University). Vol. 1, pt. 1, *Traité des maladies du bas ventre,* has 316 pp. These two volumes are lecture notes taken by a pupil of Astruc.
30. Traité de plusieurs maladies particulières. [1746?] 238 pp. MS. In his: *Traité des maladies du bas ventre,* 1746-48, vol. 1, pt. 2.
31. Traité des maladies de la poitrine. 1747. 198 pp. MS. In his: *Traité des maladies du bas ventre,* 1746-48, vol. 2, pt. 1.
32. *Idem.* 1748. 326 pp. MS. (A different text from the preceding.) In his: *Traité des maladies du bas ventre,* 1746-48, vol. 2, pt. 2.
33. *Idem.* [n.d.] 376 pp. MS. (at University of Chicago). (A still different text.) Notes taken by N. Coillot.
34. Academical lectures on fevers. London, 1747. 357 pp. [Issued from student's lecture notes.]
35. Lettre [sur l'espèce de mal de gorge gangréneux qui a régné parmi les enfans l'année 1748. Paris, le 12 février, 1749.] In: J. B. L. Chomel. *Dissertation historique sur l'espèce de mal de gorge gangréneux,* Paris, 1749, pp. 102-124.
36. Ergo morbo colica pictonum dicto, venae sectio in cubito? (*Praes.* J. Astruc.) Paris, 1751. 12 pp. (Respondent: P. L. M. Maloet.)
37. *Idem.* In: A. Haller. *Disputationes ad morborum historiam.* Lausanne, 1757-60, vol. 3, pp. 259-276.
38. Traité des maladies des vieillards. [n.p., 1762.] 378 pp. MS. (at Cornell University, Ithaca, N. Y.) Lecture notes taken by N. Coillot.
39. Utrum in curando hypopyo incisioni corneae praestet embroche. (*Praes.* J. Astruc.) [Paris, 1766.] 4 pp. (Respondent: Joannes Antonius Elie de la Poterie.)
40. Traité du scorbut, dicté au Colege Royal de France . . . recuilli par Bernard Mayraux. [n.p., n.d.] 202 pp. MS. (In possession of bookdealer Bernard Amtmann, Inc., Montreal.)

C. CONTAGIOUS DISEASES

41. Dissertation sur la peste de Provence; dissertatio de peste provinciali. Zürich, 1721. 63 pp.
42. *Idem.* 2.éd. Montpellier, 1722. 120 pp.
43. *Idem.* Toulouse, 1724. 120 pp.
44. Beschreibung der provencalischen Pest. Zürich, 1721. 77 pp.
45. Dissertation sur l'origine des maladies épidémiques, et principalement sur l'origine de la peste. Montpellier, 1721. 120 pp.
46. *Idem.* 1722. *Citation.*
47. Dissertation sur la contagion de la peste. Toulouse, 1724. 152 pp.
48. *Idem.* 1725. *Citation.*
49. Doutes sur l'inoculation de la petite vérole proposés à la Faculté de Médecine de Paris. [Paris], 1756. 15 pp.
49a. Rapport sur le fait de l'inoculation de la petite vérole, lu en présence de la Faculté de Médecine de Paris. Paris, 1765. 125 pp. (Signed by L'Epine, Astruc, Bouvart, Baron, Verdelhan, and Macquart.) An unpublished English translation by Dr. D. A. H. Moses of London is in the Yale Historical Medical Library.

D. VENEREAL DISEASES

50. De morbis venereis libri sex. Paris, 1736. 599 pp.
51. *Idem.* Paris, 1738. 628 pp.
52. *Idem.* Basel, 1738. *Citation.*
53. *Idem.* Venice, 1741. 639 pp.
54. De morbis venereis libri novem. 2.éd. Paris, 1740. 2 vols.
55. *Idem.* 2d Venice ed. Venice, 1748. 2 vols.
56. *Idem.* new ed. Venice, 1756. 2 vols.

57. *Idem.* new ed. Venice, 1760. 2 vols.
58. *Idem.* new ed. Naples, 1768. 2 vols.
59. *Idem.* new ed. Venice, 1790. 2 vols.
60. An abstract of Dr. Astruc's book, De morbis venereis. [116 pp.] In: John Armstrong. *A Synopsis of the history and cure of venereal diseases.* London, 1737, pp. 404-519.
61. A treatise of the venereal disease in six books . . . trans. by Wm. Barrowby. London, 1737. 2 vols.
62. *Idem.* in nine books. London, 1754. 2 vols. in 1 (404, 338 pp.)
63. *Idem.* in nine books. 2d ed. London, 1756. 742 pp.
64. A treatise on the venereal disease [trans. by Samuel Chapman]. London, 1755. 2 vols.
65. *Idem.* 2d ed. London, 1770. 490 pp.
66. Traité des maladies vénériennes . . . trad. du Latin. Paris, 1740. 3 vols.
67. *Idem.* 2.éd. Paris, 1743. 4 vols.
68. *Idem.* 3.éd. Paris, 1754-55. 4 vols.
69. *Idem.* 4.éd. Paris, 1773-74. 4 vols.
70. *Idem.* 4.éd. Paris, 1777. 4 vols. (Dates of Nos. 69 and 70 are correctly cited; both sets are in The Wellcome Historical Medical Library.)
71. [German translation of *Tractatus de morbis venereis* by Gottlob Hesse.] Leipzig, 1761. *Citation* (Haller).
72. Tratado de las enfermedades venéreas . . . tr. al español por Felix Galisteo y Xiorro. Madrid, 1772. 4 vols.
73. *Idem.* 2d. ed. Madrid, 1791. 495 pp.

E. GYNECOLOGY

74. A treatise on all the diseases incident to women. Trans. from a MS copy of the author's lectures read at Paris 1740 [by J. R.]. London, 1743. 480 pp.
75. *Idem.* . . . on all the diseases of woman. London, 1747. *Citation.*
76. A treatise on the diseases of women. London, 1762. 2 vols.
77. *Idem.* London, 1762-67. 3 vols.
77a. Traité des maladies des femmes. 1756. 666 pp. MS. (at Yale Historical Medical Library). It has been questioned whether this may be the author's copy, written for him by an assistant.)
78. Traité des maladies des femmes. Paris, 1761-65. 6 vols.
79. *Idem.* Avignon, 1763. 3 vols.
80. *Idem.* Lyons, 1763-65. 3 vols.
81. *Idem.* 2.éd. Paris, 1770. 7 vols.
82. *Idem.* 2.éd. Paris, 1785. 6 vols.
83. Tractatus de morbis mulierum. Venice, 1763-67. 2 vols.
84. *Idem.* Naples, 1769. 2 vols.
85. *Idem.* Venice, 1783. 2 vols.
86. Theoretisch-practische Abhandlung von den Frauenzimmer-Krankheiten. Aus dem Französischen übersetzt . . . von C. F. Otto. Dresden, 1768-72. 4 vols.

F. OBSTETRICS

87. L'art d'accoucher reduit à ses principes. Paris, 1766. 392 pp.
88. *Idem.* Paris, 1768. 308 pp.
89. *Idem.* Paris, 1771. 312 pp.
90. *Idem.* Paris, 1785. 392 pp.
91. Elements of midwifry . . . trans. by S. Ryley. London, 1766. 196 pp.
92. Art of midwifery reduced to principles. London, 1767. 362 pp.
93. Ars obstetricia ad sua principia redacta. [Venice, 1767.] 96 pp.
94. *Idem.* [Venice, 1783.] 96 pp.

G. TUMORS

95. Traité des tumeurs expliqué l'an 1736. [n.p., n.d.] 422 pp. MS. (at University of Toulouse). Lecture notes taken by a pupil?
96. Traité des tumeurs et des ulcères. Paris, 1759. 2 vols.
97. *Idem.* 2.éd. Paris, 1768. 2 vols.
98. *Idem.* 2.éd. Paris, 1785. 2 vols. (This issue and the preceding one are in The Wellcome Historical Medical Library.)
99. Abhandlung von Geschwülsten und Geschwüren. Dresden, 1761. 2 pts. in 1 vol.
100. *Idem.* Dresden, 1790-91. 2 pts. in 1 vol.
101. Tractatus de tumoribus et ulceribus. Venice, 1766. 240 pp.
102. Recueil de plusieurs pièces concernant: Le traité des tumeurs et des ulcères. Paris, 1759. 115 pp.

H. PSYCHOLOGY AND NEUROLOGY

103. Quaestio medica de naturali et praeternaturali judicii exercitio (*Praes.* J. Astruc.) Montpellier, 1718. 41 pp. (Respondent: Andraea Josephus Seron.)
104. *Idem.* Montpellier, 1720. *Citation.*
105. *Idem.* Montpellier, 1723. *Citation.*
106. Dissertatio medica de sensatione (*Praes.* J. Astruc.) Montpellier, 1720. 54 pp. (Respondent: Antonius Malevergne du Masdoumier.)
107. Dissertatio medica de phantasia sive imaginatione (*Praes.* J. Astruc.) Montpellier, 1723. 41 pp. (Respondent: Gabriel Moustelon.)
108. *Idem.* In: A. Haller. *Disputationum anatomicarum selectarum volumen.* Göttingen, 1748, vol. 4, pp. 447-472.
109. Quaestio medica, An sympathia partium a certa nervorum positura in interno sensorio? (*Praes.* J. Astruc.) Paris, 1736. 8 pp. (Respondent not given.)
110. *Idem.* In: A. Haller. *Disputationes anatomicae.* Göttingen, 1749. Vol. 4, pp. 473-480.
111. *Idem.* . . . in sensorio interno? Paris, 1743. In: G. F. Sigwart. *Quaestiones medicae parisinae.* Tübingen, 1760, pp. 212-219.
112. *Idem.* In: G. F. Sigwart. *Quaestiones medicae parisinae.* Tübingen, 1789, pp. 212-219.

I. CONTROVERSY WITH THE SURGEONS

113. Cinq lettres dans le procès des médecins contre les chirurgiens. Paris, 1737-38. (Dezeimeris says these first appeared separately, then were reprinted with the above title. No copy of this title was found.)
114. Recueil de pièces et mémoires pour les maîtres en l'art & science de chirurgie contre la Faculté de Médecine, concernant la déclaration du Roi du 23 avril 1743. Paris, 1750, vol. 2.
    Contents:
    Lettre . . . le 17 avril 1737. 22 pp.
    Seconde lettre . . . le 1 juin 1737. 16 pp.
    Troisième lettre . . . le 1 novembre 1737. 39 pp.
    Quatrième lettre . . . le 1 décembre 1737. 56 pp.
    Cinquième lettre . . . le 8 mars 1738. 7 pp.
    Réflexions sur la déclaration du Roy du 23 avril 1743. [n.d.] 12 pp.
    Etat des contestations entre la Faculté de Médecine . . . et la Communauté des Maîtres-chirurgiens-jurés. Paris, 1747. 18 pp.
115. Lettre d'un médecin de Paris à un médecin de province sur la place de médecin consultant occupée par M. La Peyronnie. [n.p., 1738.] 15 pp.
116. Mémoire pour la Faculté de Médecine de Paris, contre les maîtres chirurgiens. [Paris? 1743?] 16 pp.
117. La nécessité de maintenir dans le Royaume les écoles de chirurgie qui sont établies dans la Faculté de Médecine. Paris, 1749. *Citation.*
118. Lettre d'un ancien professeur en médecine de la Faculté de Paris à M. Vandermonde. Amsterdam, 1759. 29 pp.

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124. *Idem.* Paris, 1740. 630 pp.
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126. *Idem.* In his: *Mémoires pour l'histoire naturelle de la province de Languedoc.* Paris, 1740, pp. 257-284.

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134. Observation sur la machine appelée Fauteuil de poste. *Mercure de France.* Avril, 1735, pp. 677-688.
135. Catalogue des livres de feu M. Astruc. Paris, 1766. 271 pp.

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Notes and Events

Edited by Dorothy M. Schullian•

King George V's Last Illness

The illnesses of famous people pose special problems for their physicians. Should they say nothing (e.g., in the case of President Cleveland's jaw operation), or should they tell virtually all (e.g., in the case of President Eisenhower's various afflictions)? The last illness of King George V of England suggests another possibility—a bilateral approach. During the course of King George's final illness, relatively nontechnical bulletins were issued; and shortly after his death *The Lancet* and the *British Medical Journal* each carried a more detailed and technical report for members of the medical profession. The bulletins were published as follows (*Brit. med. J.*, 1936, *1*, 190):

Late on Friday, January 17th [1936], it became known that the King was confined to his room with a cold, and the following bulletin, issued that night from Sandringham, was published in all the newspapers on Saturday morning:

"The bronchial catarrh from which His Majesty the King is suffering is not severe, but there have appeared signs of cardiac weakness which must be regarded with some disquiet."

This was signed by Sir Frederic Willans . . . ; Sir Stanley Hewett . . . ; and Lord Dawson of Penn. . . . On Saturday at 10.15 a.m. the following appeared over the same three signatures:

"The anxiety expressed in the bulletin of last night persists."

At 3.30 p.m. on Saturday the following bulletin, signed also by Sir Maurice Cassidy, . . . was issued:

"His Majesty the King has had some hours of restful sleep. The cardiac weakness and the embarrassment of the circulation have slightly increased and give cause for anxiety."

At 10 o'clock that evening, after Sir Maurice Cassidy had returned to London, it was officially announced that there was no change to report. On Sunday, January 19th, at 11 a.m., the following bulletin was issued:

"In spite of a restless night, His Majesty the King has maintained strength."

That evening at 7.15 it was announced that His Majesty had passed a quiet day, and there was no change in his condition. The bulletins issued from Sandringham House on Monday, January 20th, were as follows:

10.45 a.m. "The King has had a more restful night. There is no substantial change to record in His Majesty's condition."

• Cleveland, Ohio.

5.30 p.m. "The condition of His Majesty the King shows diminishing strength."

9.25 p.m. "The King's life is moving peacefully towards its close."

Surely nothing could be more simple, dignified, and moving than this last superb bulletin; clearly a case can be made out for sparing the general public technical details on such occasions. The final, more technical, assessment (carried in almost identical wording by *The Lancet*, 1936, *1*, 212 and the *British Medical Journal*) was as follows:

Though it is understood that for some weeks His Majesty's health had not been altogether satisfactory the King was able to go out, and in fact rode on his pony for a short time on Wednesday, January 15th. On Thursday, January 16th, the King showed signs of a mild catarrh, which soon began to abate.

The 'disquiet' expressed on Friday and Saturday arose from evidences of cardiac insufficiency. The margin of cardiac reserve had in recent days been narrowing. This illness therefore arose from within, and was in the nature of a culmination. It was thus not comparable to the invading streptococcal septicaemia localizing at the base of the right lung from which King George suffered seven years ago. That illness inevitably placed heavy burdens on the heart, and therefore may have had a causal relationship to this last illness. It is a remarkable achievement for King George to have recovered from septicaemia and to have reigned over his Empire for seven years through times which have been eventful and sometimes anxious.

This last brief chapter of the King's life showed that the body carried through its work till its powers were ended and then came to rest after an illness short and peaceful in its close.

According to Francis Watson, the foregoing notes were prepared by Lord Dawson of Penn (*Dawson of Penn*, London, 1950, p. 281). Watson also records (pp. 278-9) the following notes taken by Lord Dawson the night that the King died:

Evening, cyanotic—recumbent flat in bed. Slowly progressive myocardial failure—no obvious lung congestion, but cerebral thrombosis and almost venous stasis. . . .

These notes are in more or less complete accord with those which appeared in a letter (dated January 18—two days before the King died) from Sir Maurice Cassidy to Sir Humphry Rolleston. This letter (see Fig. 1), which was recently acquired by the Department of the History of Medicine of the University of Kansas, has the following remarkably frank postscript:

The King has been increasingly drowsy for weeks—falling asleep when at table, or at his desk & also increasingly dyspnoeic. On Wednesday his legs became very oedematous & cyanosis increased rapidly. The oedema went on digitalis, but he continues to be blue & breathless, with some bronchitis. Also there is some weakness of the rt. arm, & he is very drowsy. Temp 99 or 100 the first day, normal since. Extremities cold & livid. Heart regular at

PADDINGTON 1846.

42, MONTAGU SQUARE,
W.1.

January 18th, 1936.

Dear Sir Humphry,

I shall be delighted to do my best for you, as suggested in your letter of January 15th. Could you later on give me some indication as to the nature of the seventeen other articles?

With kind regards,

Yours sincerely,

Maurice Cassidy.

Sir Humphry Rolleston, Bt.
G.C.V.O., K.C.B.,
Controlling Editor,
The Practitioner,
6/8 Bouverie Street,
E.C.4.

Confidential

The King has been unwell for some weeks - failing appetite when ill health, & ill health & also increasing dyspnoea. On Wednesday his legs became very edematous & the cyanosis increased rapidly. The edema went in Nephritis, but he

FIG. 1. Letter dated 18 January 1936 (two days before the death of King George V) from Sir Maurice Cassidy to Sir Humphry Rolleston.

80. B.P. 130/80. Presumably a slow peripheral failure. Outlook I imagine quite hopeless (the others, who know him better, say not). But he might conceivably last for weeks. Let us hope that he won't become hemiplegic & aphasic & recover for a time!

From the point of view of public relations, King George V's last illness was well handled at both public and professional levels, and it may be that this is the model *par excellence* for what are always exacting professional problems—the illnesses of the illustrious.

Continues ill he blue & breathless, with
some bronchitis. Also there is some
weakness of his Rt arm & hand, & he is very
drowsy. Temp 99 or 100 this first
day, normal since. Extremities
cold & livid. Heart regular
at 80. B.P. 130/80.
Presumably a slow peripheral
failure continues. I suppose gentle
hopeless (like others, rather hope him better,
say not). But do he might conceivably
last for weeks. Let us hope that
he won't become hemiplegic & aphasic &
recover for a time!

L. R. C. AGNEW

On Blaming the Patient for his Disease

Professor C. D. O'Malley[1] has given us a fascinating account of the fluctuating state of health of Charles V. Only after reading such a realistic portrayal do we appreciate what an important thing to a statesman is his health, and what a great part in history has been played by the sickness of sovereigns. But the causes of death accepted at the time have not always been accurate. In every age the ruling diagnosis has depended on the con-

[1] O'Malley, C. D. Medical history of Charles V. *J. Hist. Med.*, 1958, *13*, 469-482.

temporary state of knowledge; even today little is known about the actual mechanism by which any fatal disease brings about its effects.

The temptation to blame the patient for his disease—especially for a chronic disease—has always been in the background. Temkin[2] has made a careful investigation of the problem of moral responsibility. Sydenham was one of the first doctors to say that we should treat venereal diseases, which others regarded virtually as self-inflicted wounds or as just punishment for sin. Gout and many other disorders were thought to be equally the effects of self-indulgence.

In the days of Charles V, the dietary causation of disease was an article of faith. It was a corollary to the doctrine of the four humours. If a sick Emperor ignored the fasting requirements of his doctors, his sin of omission was duly recorded as a cause of death.

A century ago Thomas Inman of Liverpool inveighed against the unkind word "hysteria" in the case of patients who displayed unaccountable symptoms. He complained that for hysteria "marriage was recommended with such delicate pertinacity that the world began to consider *hysteria* to be synonymous with *salaciousness;* and a fit of hysterics was supposed to be the analogue of the leaping of one cow upon its fellow."[3] In another communication Inman protested against the propensity amongst medical writers to set up a number of cities of refuge, to which all those symptoms might be sent which could not satisfactorily be assigned to definite seats.

> This style of reasoning [he wrote] reminds us of the Pickwick Club, in which an insult ceased to be so, when it was stated that the words were used in a 'Pickwickian' sense; for in medicine, pain is no pain, and suffering no suffering, in an hysterical sense. An hysterical pain is one which a patient feels, but has not; which has no existence; but which, by being thought upon, may grow, until it is unbearable![4]

Doctors today have not abandoned this unfortunate habit, which has been fostered by the growth of psychiatry. Medical writing is littered with such regrettable terms as "compensation neurosis" and "hysterical overlay," which indicate the power of the ancient temptation to blame the patient for his disease.

MICHAEL KELLY

The Teaching of Surgery at the University of Montpellier in the Thirteenth Century

While it is possible to give a general picture of medieval medical education, a really comprehensive account cannot yet be written. Before this can be done it will be necessary to survey the various MSS. of the period for

2 Temkin, O. Medicine and the problem of moral responsibility. *Bull. Hist. Med.,* 1949, *23,* 1-20.

3 Inman, T. Experience in medicine. *Brit. med. J.,* 1858, 923-927.

4 Inman, T. On so-called hysterical pain. *Brit. med. J.,* 1858, 24-25.

incidental references to education and educational techniques. Recently I ran across a commentary printed by Karl Sudhoff,[1] literally "Notes on Surgery," which gives some valuable information on the teaching of surgery at Montpellier in the 13th century. Sudhoff found the commentary in a manuscript of the Leipzig University Library (Cod. 399) which also contains the *Cyrurgia willehelmi de Congenis* with which the commentary is concerned and some theological tracts. The surgical portion is in a 14th century hand. Nothing identifies the author of the commentary, but Sudhoff advanced the theory that he may have been a German student of William of Congenis at Montpellier in the 13th century who traveled in both France and Italy before returning to practise medicine in the Weser Valley in Germany.[2] The manuscript was written some years after the death of Congenis.[3]

Of importance to the study of medical education are two brief passages in the notes.

Master William, by custom, read to the scholars at least twice a year, at the Festival of the Nativity of Our Lord and at Easter.[4] When the other [masters] ceased reading, he began. This was his way of reading: He held the Surgery of Master R[oger] before his eyes; but he did not read as one is usually said to read, but following the order of the chapters, he taught his own method of operating. He approved of some of the sayings of the masters, some he changed for the better, but some he cut out entirely.[5]

William of Congenis, however, did more than lecture, he also demonstrated in the wards of the Hospital of the Holy Spirit in Montpellier.

For students who plan to operate later ought to willingly present themselves to see the incisions which are made about the cranium, intestines, and internal members. They should learn to operate not only by hearing but by seeing it done. This will give them a complete knowledge of operating and in addition the confidence which is very necessary to surgeons. At Montpellier in the Hospital of the Holy Spirit, when the master had to trephine a wounded person, one of the students present fainted when after the

1 See Karl Sudhoff, "Domini et magistri Willehelmi de Congenis, Burgensis zu Montpellier Scriptum cirurgiae, sowie dazugehörige 'Notulae cirurgiae' eines Schülers," *Beiträge zur Geschichte der Chirurgie im Mittelalter* (2 vols., Leipzig, Verlag von Johann Ambrosius Barth, 1918), II, 297-384.

2 *Ibid.*, pp. 307-310.

3 For a comprehensive account of Congenis, see Sonoma Cooper, *The development of the Medical School at Montpellier* (Unpublished Ph.D. dissertation, University of California, 1938). She devotes several chapters to him.

4 That is, during the vacation period at Montpellier. The school year was divided into two terms plus a vacation period at Christmas. Christmas vacation was from eight days before Christmas until Epiphany Sunday. The first term ended on Palm Sunday. There was also a summer vacation and William might have read then also.

5 Audiendo magister Willehelmus bis in anno ad minus scolaribus legere consueuerat, in festo natiuitatis domini et in pasca . . . [cum] alii cessauerunt legere, ipse incepit. Iste autem suus legendi modus fuit. Cirurgiam magistri [R.] pre oculis habuit. Sed illam non legit, secundum quod aliquid legi dicitur, sed secundum ordinem illorum capitulorum modum suum operandi docuit, quedam dicta magistri approbauit, quedam in melius commutauit, quedam autem . . . prorsus amputauit. Sudhoff, p. 312.

trephining he saw the movement of the brain; therefore I counsel you that no one attempt such a thing, unless he first has seen others do it.[6]

It appears from these few lines that while surgery was taught at Montpellier in the 13th century, it was not part of the formal university curriculum. This perhaps explains why in the 15th century Montpellier declined as a center of surgical studies, and why it never offered a degree in surgery.[7] More important, the few lines indicate that the hospital facilities of Montpellier were really used for demonstration purposes and that in surgery, at least, theory was backed up with practical demonstrations.

VERN L. BULLOUGH

The Tiber Island

The 60th Congress of the Società Italiana di Medicina Interna was held in Rome 19-21 October 1959. For it, and in tribute to Guido Baccelli, who founded the society, Luigi Belloni prepared a booklet of 31 pages entitled *Da Asclepio ad Esculapio.* Published by Ciba Industria Chimica and graciously presented to Congress members, it gathers in handsome format accounts by Valerius Maximus, Livy, Ovid, Pliny, the *Liber de viris illustribus urbis Romae,* and Giovanni Tortelli of the transfer of the serpent from Epidaurus to the Tiber Island in the year 293 B.C. With the serpent's arrival, it will be remembered, the plague which had raged for three years abated, the Greek god Asclepius was adopted by the Romans as Aesculapius, and there was consecrated on the Tiber Island a devotion to medicine which continues uninterrupted today in the work of the Fatebenefratelli in the Ospedale di S. Giovanni di Dio, located a stone's throw from the site of the Temple of Aesculapius.

In ancient times the island was made to resemble a ship, and until the building of the modern embankments to prevent the Tiber from flooding a considerable part of the travertine stern was visible at the east end of the island. A few blocks still remain. This travertine is simulated in color in the cover paper of the booklet, together with the staff and serpent in relief and a portion of a bust of the god. Included within are illustrations of the island from the painting of Gaspare Vanvitelli, the engravings of Étienne Dupérac and Giambattista Piranesi, and a 16th century reconstruction in a Vatican manuscript; of the Aesculapius fresco of Federico Zuccari; and of the statue of the god in the Museo Nazionale of Naples. In addition there are several illustrations bearing on Guido Baccelli, who 65 years earlier had chosen for a similar occasion a medal, now struck again for this congress,

[6] Scolares etiam, qui post proponunt operari, libenter presentes esse debent et uidere incisiones, qui fiunt circa craneum, intestina et menbra interiora et ipsi discant operari, non solum audiendo sed etiam uidendo, quia sic operandi habebunt scientiam completam et preter hoc audaciam, que multum cirurgicis est necessaria. Ad montem pessulanum in hospitali sancti spiritus, cum magister deberet trepanizare quendam uulneratum, quidam ex scolaribus astantibus post remocionem cranei, cum uideret motus cerebri, sincopizauit, et ideo consulo, quod nullus aliquid talium attemptet, nisi prius alium uiderit facientem. *Ibid.,* pp. 317-18.

[7] See my "The development of the medical university at Montpellier to the end of the fourteenth century," *Bull. Hist. Med.,* 1956, *30,* 522.

from an ancient Roman coin representing the arrival of the serpent on the island.

The opening remarks in the booklet are by the President of the Society, Luigi Villa. Text and illustrations, three of which are in color, are fully documented, and the booklet is at one and the same time informative, attractive, and scholarly, as befits a tribute to the great clinician who adopted for himself the thoughtful words of Baglivi, "Novi veteribus non sunt opponendi sed perpetuo iungendi foedere."

New Departments of the History of Science and Medicine

New programs in the history of science have been announced within recent months at Princeton University, Indiana, and Yale, and a Division of Medical History at the University of California in Los Angeles. These developments will be welcomed by existing centres for the History of Science, such as those at Wisconsin and Harvard.

Princeton University. A graduate program is offered in the History and Philosophy of Science which is to be a joint undertaking of the Departments of History and Philosophy under the general auspices of the Council of the Humanities. Senior staff members are Carl G. Hempel, Stuart Professor of Philosophy (philosophy of science), Charles C. Gillispie, Professor of the History of Science (history of modern science), Hilary Putnam, Jonathan Edwards Preceptor (logic and philosophy of physics), and John Murdoch, John Witherspoon Preceptor (ancient and medieval science).

Indiana University. The Graduate School of Indiana University has announced a new Department of History and Logic of Science offering an integrated program of studies leading to the A.M. and Ph.D. degrees. Chairman of the Department is Professor Norwood Russell Hanson, to whom all enquiries concerning admission should be addressed (Indiana University, Bloomington, Indiana). The Advisory Committee consists of Professors A. R. Hall (History of Science), Marie Boas Hall (History of Science), E. Grant (History of Science), A. Grunbaum (Logic of Science), R. Buck (Logic of Science), N. R. Hanson (Logic of Science).

UCLA. A division of medical history has been established with full-time personnel in the University of California Medical Center. The division is presently a small one staffed by Professor C. D. O'Malley and Dr. Rupert Hall. It is additionally assisted from time to time by other lecturers: Drs. H. W. Magoun, John Field, Robert J. Moes, Elmer Belt, and Miss Louise Darling. Regular lecture courses covering the general development of the history of medicine and specialized subjects have been instituted for medical students and others interested. As the needs of space are met it is planned to increase both the size of the division and the scope of the offerings.

Yale University. On 20 February 1960 Yale University also announced the creation of a new Department of the History of Science and Medicine

under the Chairmanship of the Editor of this *Journal,* who had previously been in charge of the Department of the History of Medicine. A new Chair of the History of Science has been created and will be occupied by Visiting Professor Derek J. de Solla Price, Ph.D. London (1946) and Cambridge (1954). Appointed at the same time, as from July 1960, was Leonard Gilchrist Wilson, M.Sc. London (1955) and Ph.D. Wisconsin (1958), Visiting Assistant Professor in the History of Science at Cornell University. The Department is to offer instruction in Yale College, the Graduate School, and the Medical School and will accept candidates for the M.A. and Ph.D. degrees in the History of Science and Medicine. The Department will be responsible to the President of the University and the Deans of the Graduate and Medical Schools through a Governing Board made up of Norman S. Buck, University Provost; Hartley Simpson, Dean of the Graduate School; Dr. Vernon W. Lippard, Dean of the School of Medicine; Joseph S. Fruton, Professor of Biochemistry; G. Evelyn Hutchinson, Sterling Professor of Zoology; George W. Pierson, Professor of History; S. Dillon Ripley, Director of the Peabody Museum; Dr. Fulton and Dr. Price.

This *Journal* will serve as a medium of publication for the new Department since it has always included the allied sciences with the history of medicine.

Welcome at Wisconsin for Professor Rath

The faculty group working in the history of the sciences and professions at the University of Wisconsin comes to full strength with the arrival of Professor Gernot Rath, medical historian from Bonn. Besides chairs for the history of medicine and history of pharmacy, there are now five other posts at Wisconsin in the history of physical and biological sciences. The combined resources of the group reinforce postgraduate programs offered in the individual specialties. Professor Rath was welcomed into the joint activities of the history of science group at a luncheon held January 26th at the University Club upon his arrival.

Medicinhistorisk Årsbok, 1959

The seventh yearbook of the Medical-Historical Museum in Stockholm, edited by Wolfram Kock and printed by Gustaf Lindströms Boktryckeri (Stockholm, 1959), presents as usual a rich miscellany of articles which contribute much to our knowledge of the history of medicine. It serves also as organ of the Danish Society for the History of Medicine and carries therefore an introduction by the president of that society, Edv. Gotfredsen. Prefatory remarks by Dr. Kock stress the effort to make the yearbook a Scandinavian publication; they record also the Museum's activities during 1959, a year which was characterized by collaboration in medico-historical enterprises among the northern countries.

The articles are separately paginated and in most cases are reprinted from other organs, in particular *Farmaceutisk Revy, Medicinsk forum,*

Nordisk medicin, Svensk farmaceutisk tidskrift, Svenska läkartidningen, Tandlaegebladet, and *Tidskrift för sveriges sjuksköterskor.* This is an excellent means of circulating more widely among historians papers which appear first in nonhistorical journals, and the process is facilitated here by the fact that a summary in English is provided for each article. The articles, many of which are illustrated, are listed below; anyone desiring a copy of the yearbook may obtain it for ten kronor from Medicinhistoriska Museet, Åsögatan 146, Stockholm Sö, Sweden.

V. G. Brøndegaard and Jørgen Fakstorp. Juniper.

Carl-Johan Clemedson. Carl Ludwig Schleich—a centennial anniversary.

Elisabet Dillner. Two words difficult to interpret on an altar-piece in the church of Torsvi. The two words on the triptych, whose date 1628 can easily be remembered, are read by the author as Mitridat and Theriak.

———. The University Hospital in Uppsala—250 years.

Karin Elfverson. The establishment by Queen Sophia in 1884 of the training school for nurses at Sophiahemmet.

Lauritz Gentz. What did C. W. Scheele look like? The article, which is profusely illustrated, provides also a biography of the renowned chemist, with a review of his great work *Chemische Abhandlung von der Luft und dem Feuer* and a discussion of his relations with Kirwan, Lavoisier, and Priestley.

Folke Henschen. Health and disease in Old Egypt.

Wolfram Kock. Origin of the university hospitals in Sweden. This paper was presented before the International Congress of the History of Medicine in Montpellier in 1958.

———. Cupping in the 1900s in Sweden. The author had appealed over the radio for personal reminiscences of cupping, and this paper discusses the 39 letters which he received in response. Cupping is still practised in remote country districts of Sweden.

Jan Lindberg. Cholera in Sweden in 1853.

Leif Marvitz. Excerpts from the Reverend Oluf Lundt's entries in the church register of the Vaeggerløse Parish. Three entries from the period 1682-1730 are noted; they describe a malignant tumor of the face, an example of superstition, and a case of murder by poison. There is also discussion of a painting of about 1780 showing a monstrous tumor of the face.

Harald Nielsen. Rhizoma valerianae.

———. Mumia vera.

Karin Östberö. Imhotep, medical papyri, and the Egyptian art of healing.

Louis Perret. Medical activity in the University of Åbo at the beginning of the 19th century.

Lennart Plengiér. Health rules by an 18th century poet. The poem, by Olof von Dalin, was set to music by Johan Helmich Roman.

Eric Salingre. Excerpts from the history of the treatment of ear diseases from Vesalius to Hans Wilhelm Meyer.

Erik Schiødt. The tradition of suicide in Denmark.

Egill Snorrason. The Swedish storming of Copenhagen in 1659. Nicolaus Steno was one of the ardent defenders.

Hugo Theorell. Berzelius and vitality.

Worthy of mention also is an article by the Secretary of the Danish Society for the History of Medicine, Egill Snorrason, which is not included in the *Årsbok*. Published in the *Archiv for pharmaci og chemi*, 1958, *65*, 1020-1032, it describes the library of Poul Hauberg, owner of Stenlille Pharmacy, who on 23 October 1958 received the Lederle award. Mr. Hauberg died on 23 September 1959; his library is now being sold at auction.

Exhibition on the History of Oriental Medicine

Following close upon the publication of the history by Pierre Huard and Ming Wong entitled *La médecine chinoise au cours des siècles*, which will be reviewed in a later issue, there was prepared by the Entretiens de Bichat and held first at the Salpêtrière and then at the Hôtel de la Fondation Singer-Polignac in Paris 23-31 October 1959 an exhibition on the history of medicine in the Far East. The particular occasion for the second display was the "Colloque" on research of the Instituts Français de Sciences Humaines en Asie. Some 50 museums, libraries, institutes, academies, societies, private individuals, and antiquarians co-operated in the effort, and assistance came not only from various centers in France but also from Leiden, Bern, and Bangkok. A detailed catalogue of 106 pages, *Exposition sur l'histoire de la médecine en Extrême-Orient*, was compiled by Pierre Huard, Jacqueline Sonolet, and Ming Wong and published by the Fondation Singer-Polignac, 43 Avenue Georges-Mandel, Paris-XVI°. It carries a preface by Roger Heim, President of the Fondation.

The catalogue, which is copiously annotated and illustrated, provides at the beginning brief outlines of Chinese and Japanese medicine and a statement on their relations with other systems of medicine in East and West. The exhibition numbered 304 items divided among manuscripts (Western, Chinese and Manchurian, Japanese, and of other Eastern origins), printed books (Western, Chinese, Japanese, Vietnamese), anatomical plates (Chinese, Japanese), prints and engravings, and objects of various materials and kinds (Chinese, Japanese, Vietnamese, and Korean). The importance of the exhibition in an era when the West is trying to know the East better is obvious. Three fundamental themes stand out clearly, the essential role of Chinese medicine in the development of other medical sciences in the Far East, the originality and vigor of Japanese medicine which rapidly underwent Western influence and made notable contributions to modern therapeutics, and the important relations in medicine between Europe and the Far East in the 17th, 18th, and 19th centuries.

Particularly startling for their Vesalian reminiscences are the muscle men which are reproduced from an eight-volume manuscript anatomy in Manchurian [no. 12] which was adapted by the Jesuit Dominique Parennin from the works of Thomas Bartholin and Pierre Dionis. Western interest in Eastern medicine was represented by such items as Andreas Cleyer, *Specimen medicinae sinicae, sive opuscula medica ad mentem sinensium* (Francofurti, Sumptibus Joannis Petri Zubrodt, 1682) [no. 57]; Willem ten Rhijne,

Dissertatio de arthritide: mantissa schematica: de acupunctura: et orationes tres. . . . (Londini, Impensis R. Chiswell, 1683) [no. 91bis]; Pierre Joseph Buc'hoz, *Herbier, ou collection des plantes médicinales de la Chine* (Paris, chez l'Auteur, 1781) [no. 53]; Pierre Sue, *Mémoire sur l'état de la chirurgie à la Chine* (Paris, de l'Imprimerie de la Société de Médecine, an IX [1801]) [no. 86]; and Louis V. Joseph Berlioz (who was the father of Hector Berlioz), *Mémoires sur les maladies chroniques, les évacuations sanguines et l'acupuncture* (Paris, Croullebois, 1816) [no. 48]. Specimens of eyeglasses, ivory figurines, pharmaceutical jars, opium boxes, ex-votos, surgical instruments, and the like supplemented the display of manuscripts and printed books.

In this connection attention is called to the recent exhibit on Chinese medicine which was held in the Clendening Library and which is described in the *University of Kansas Medical Center Bulletin,* 1959, *11,* 10.

Haller's Biographical Embarrassment

In a recent letter to the Editor of the Journal Dr. Joshua Leibowitz of the Hebrew University, Jerusalem, called attention to a paper on Albrecht von Haller by the distinguished Swiss anatomist and historian, Erich Hintzsche. This paper, which appeared in *Gesnerus,* 1959, *16,* 1-15, relates a diverting incident concerning the first comprehensive biography of Haller, *Das Leben des Herrn von Haller,* which was published by his pupil Johann Georg Zimmerman in Zürich in 1755 when Haller was in his 46th year. In the same year Haller wrote for *Göttingische Anzeigen von gelehrten Sachen* (1755, 615-616) an unsigned review of the biography. In this, though he conceded that the biography was historically correct ("Wir haben nichts der historischen Richtigkeit wiedriges gefunden"), he nonetheless took issue with its author at more than one point, finding, for example, a certain partiality of pupil toward teacher in some accounts of his relations with his scholastic adversaries. Any scholar placed in a similar position today and desirous of reading the entire review will find it available at the New York Public Library.

It is a pleasure to add that in the series *Berner Beiträge zur Geschichte der Medizin und der Naturwissenschaften* which is edited by Prof. Dr. Hintzsche and by Prof. Dr. W. Rytz there appeared in 1959 as No. 18 a bibliography of Haller, *Verzeichnis der gedruckten Schriften Albrecht von Hallers,* by Susanna Lundsgaard-Hansen-von Fischer. The work of many years of patient verification, it will prove a boon to both medical and literary historians and to all librarians who are concerned with cataloguing Haller's very numerous and often bibliographically complicated publications.

History of the Medical Department, United States Army, in World War II

At the request of The Historical Unit, United States Army Medical Service, this department calls attention to the 15 volumes already issued of

the total of 48 scheduled in the series *The History of the Medical Department, United States Army, in World War II.*

The value of this history should be obvious to the readers of this journal. It presents straightforward accounts of the wartime activities of the Medical Department in the fields of surgery, preventive medicine, internal medicine, neuropsychiatry, dentistry, veterinary medicine, and administration. The effort is collaborative and co-operative; the authors and editors are many and are among the outstanding medical and medicomilitary authorities in the country. The volumes are illustrated and are provided with tables and charts. Because they have been issued singly, irregularly, and over a period, to date, of eight years, it is possible that some members of the profession have missed announcements or reviews of one or more of them. They are accordingly listed here as part of an endeavor to circulate information on their availability as widely as possible and so fulfill their potential usefulness. The seemingly cryptic catalogue number which is set down for each of them will be of very practical service in ordering them; to procure any of the following volumes it is necessary to send only the title, the catalogue number, and a check or money order for the stipulated amount to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.:

Surgery in World War II

The Physiologic Effects of Wounds, 1952, xi, 376 pp., D 104.11:Su 7, $3.50.
Hand Surgery, 1955, ix, 447 pp., D 104.11:Su 7/2, $3.75.
Vascular Surgery, 1955, ix, 465 pp., D 104.11:Su 7/3, $4.25.
General Surgery, 1955, xxiv, 417 pp., D 104.11:Su 7/4, v.2, $4.25.
Orthopedic Surgery in the European Theater of Operations, 1956, xv, 397 pp., D 104.11:Su 7/5, $4.00.
Orthopedic Surgery in the Mediterranean Theater of Operations, 1957, xx, 368 pp., D 104.11:Su 7/6, $4.00.
Ophthalmology and Otolaryngology, 1957, xxiii, 605 pp., D 104.11:Su 7/7, $5.00.
Neurosurgery, vol. 1, (Head and Brain), 1958, xix, 466 pp., D 104.11:Su 7/8/v.1, $5.00.
Neurosurgery, vol. 2, (Spinal Cord and Peripheral Nerve), 1959, xxvi, 705 pp., D 104.11:Su 7/8/v.2, $7.00.

Preventive Medicine in World War II

Environmental Hygiene, 1955, vii, 404 pp., D 104.11:P92/v.2, $3.50.
Personal Health Measures and Immunization, 1955, xiv, 394 pp., D 104.11:P92/v.3, $3.25.
Communicable Diseases Transmitted Chiefly through Respiratory and Alimentary Tracts, 1958, xxi, 544 pp., D 104.11:P92/v.4, $5.50.
Cold Injury, Ground Type, 1958, xxi, 570 pp., D 104.11:C67, $6.25.
Dental Service in World War II, 1955, ix, 362 pp., D 104.11:D43, $3.25.
Hospitalization and Evacuation, Zone of Interior, 1956, xxiii, 503 pp., D 114.7:M46/v.1, $4.00.

Dr. Bruno Kisch Made Consultant

Dr. Bruno Kisch has recently been made Consultant to the Smithsonian Institution in the field of Natural Sciences, especially Weights and Measures. Dr. Kisch is always pleased to have news of other collections in this field and would welcome correspondence with anyone having knowledge of them. He can be addressed at 845 West End Avenue, New York 22, New York.

Book Reviews

RENÉ DUBOS. *Mirage of Health.* (Volume 22 of World Perspectives edited by Ruth Nanda Anshen.) New York, Harper & Brothers, 1959. xv, 236 pp. $4.50.

Reviewed by PHILIP B. COWLES, *Professor of Microbiology, Yale University School of Medicine.*

THIS very readable and penetrating discussion of health as most broadly defined can be recommended without reservation to professional and layman alike. Its reading is interrupted with difficulty and finished with regret. Merely listing the chapter headings will give some idea of its wide range: The Gardens of Eden, Biological and Social Adaptation, Struggle and Partnership in the Living World, Environment and Disease, Hygeia and Asclepius, Social Patterns of Health and Disease, Effects of Disease on Populations and on Civilization, Utopias and Human Goals.

The early theme may be summed up by Lewis Carroll's " . . . jam yesterday and jam tomorrow, but never jam to-day," for man is constantly looking backward to the days of old and forward to the times to come: either is preferable to the present. But Dr. Dubos points out with many pertinent examples how dependent are health, harmony and happiness, as each age and generation define these, upon the complex ecological mesh in which we live, a mesh composed not only of varying physical conditions and innumerable competing forms of life, but also of countless ever-changing sociological factors and individual urges.

As for our physical welfare, he says, we like to believe and are often told that our immunizing methods and our antibiotics have made infectious disease all but unnecessary and that they have contributed immeasurably to an infant's life expectancy. We are reminded, however, that the decline in the incidence of many diseases of this type began before we had these tools at our disposal, and was, in fact, largely due to environmental changes introduced by intelligent idealists. Moreover, the very improvements in sanitation which contributed so much to the control of certain infections created new problems: witness the shift in the incidence of poliomyelitis to older age groups. With the organic diseases, our acquired ability to treat a few of them, diabetes, for example, rarely is accompanied by a comparable increase in our knowledge of what really causes them. It is worth noting "that the greatest strides in health improvement have been achieved in those diseases that responded to social and economic reforms after industrialization." For the most part these strides have resulted in the ability to control only microbial epidemics and nutritional deficiencies.

Certainly, the death rates in infancy and childhood are down, and body size is up. Of the value of the latter trend we are as yet quite ignorant, Dubos points out, but we are becoming more and more aware that the

increase in life expectancy, coupled with the introduction of new hazards which may have long-delayed effects, is emphasizing lines in the disease spectrum which were formerly of little prominence in that of the population as a whole. "Survival" is our watchword, not necessarily a happy or beneficial survival, and not necessarily one of the "fittest." In fact, the kind of life for which we are to be fit is ever changing.

The expansion of our knowledge in all fields and its application, each increasing at a geometric rate, affect the life and health of all of us, often adversely, and our statesmanship—medical, scientific, and political—is usually inadequate to foresee and to control the results. Man possesses an immense ability to adjust physically, mentally, and spiritually to changing environments, but these adjustments usually take time, and the present rates of change are often too rapid for his adjusting mechanisms, particularly in the last two areas. The results are disturbing. Inadequate adjustment creates conflicts and to minimize the effects of these, in place of yesterday's relatively harmless nostrums, we have today's more dangerous pep pills and tranquilizers.

Is this too gloomy a picture? Perhaps, for some, but it is man's dignity, the author emphasizes, to value certain ideals above comfort, health, and even life itself. Ants and bees may have developed a policy of public health which has functioned unchanged for millennia, but as long as man possesses freedom of will, new solutions for his ever-changing ways of life will constantly be needed. There can be no status quo; human life is an adventure, and adventure entails struggles and dangers. While man may naturally desire health and happiness, these need not be exemplified by physical vigor and a sense of well-being. Their pursuit is often guided by social rather than biological urges, and all too frequently the result is diminished biological usefulness. There can be no Utopia. "The earth is not a resting place. Man has elected to fight, not necessarily for himself, but for a process of emotional, intellectual and ethical growth that goes on forever. To grow in the midst of danger is the fate of the human race because it is the law of the spirit."

The Mirage of Health is a book of enthralling scope: the casual reader will marvel at the view spread out before him, those familiar with the field, at the artistry with which the work is done.

BENTLEY GLASS, OWSEI TEMKIN, AND WILLIAM L. STRAUS, JR., Eds. *Forerunners of Darwin: 1745-1859.* Baltimore, Johns Hopkins Press, 1959. 471 pp. $6.50.

Reviewed by JAMES C. HADEN, *Assistant Professor of Philosophy, Yale University.*

NOT so very long ago, at a well-known and reputable university, the inclusion of Darwin's *On the Origin of Species by Means of Natural Selection* in the syllabus of an interdepartmental seminar dealing with the natural

sciences was opposed strenuously by the biology department of that university—not on any of the grounds one might reasonably conjecture, such as that it has in many points been superseded by later work on evolution, but rather on the grounds that it is a *dull* book.

Without going very deeply into the mental processes of these judges of Darwin's work, we might well suppose that the grounds for such an opinion lie in a deficiency of the historical sense. The enormous impact of Darwin on virtually all divisions of contemporary life and thought is likely to be taken for granted, and when that is done, the excitement and the wonder are gone. But considered historically, this influence cries out for an adequate explanation of *why* it should have come about. This explanation clearly can only follow on a full account of *how* it came about. The year 1959 marks the centenary of the publication of the *Origin of Species*, and it has evoked an appropriately large number of papers, books, and commemorative gatherings dealing with the why and the how of Darwinian evolutionary theory.

The relevant research must, of course, go back considerably beyond 1859, in an effort to see just how it happened that Darwin should have said what he did and that the well-known effects of his book should have occurred. A collection of such papers has now been published under the title *Forerunners of Darwin: 1745-1859*. It is a fine addition to the literature concerning the theory of evolution. It does not attempt to be an encyclopedic study of the prehistory of the *Origin of Species;* in the words of its editors, it is intended "merely to establish the existence and to signify the importance of the descent of ideas for the doctrine of the descent of species." The general premise is that "the thought-pattern present in the observing mind is the ground, fertile or stony, upon which the seed falls." The search for this thought-pattern in Darwin's observant mind has but one naturally fixed limit—its *terminus ad quem*, 1859. The *terminus ab quo*, 1745, which the editors have chosen represents the date of the anonymous publication of the *Vénus Physique, contenant deux dissertations, l'une sur l'origine des hommes et des animaux: et l'autre sur l'origine des noirs*, in which its author, Pierre L.-M. de Maupertuis, argued cogently for an epigenetic explanation of variations among living things. This date is, of course, arbitrary,[1] and indeed although *Forerunners of Darwin* is divided into two main sections, respectively headed "The Eighteenth Century" and "The Nineteenth Century," it was impossible to keep strictly to this limitation. There is an opening section of "Introductory Background," consisting of two chapters which summarize biological observations, researches, and speculations with respect chiefly to the interpretation of fossils and to the concept of the biological species itself extending all the way back to the Greeks.

The book has its own descent of ideas and carries much evidence of

[1] Although there is an appropriateness to it in that 1959 is the 200th anniversary of Maupertuis's death.

this within it. Its matrix was the Johns Hopkins History of Ideas Club, and its special stimulus was the work of Arthur O. Lovejoy, the founder of that society. Of the 15 chapters, six are by Lovejoy himself, most of them more or less extensively revised from essays published as long ago as 1904.

As is usual with composite books, the quality of the several contributions varies. The two summary chapters which open it are extremely fine and the authors deal with an enormous wealth of material with skill and conciseness. Curiously enough, the section on the 18th century is as a whole more interesting and valuable than that on the 19th. Perhaps the chief reason is that one of the conclusions diffused through many of the essays is that the essentials of the theory of the transformation of species were publicly known long before 1859. In fact, the best chapter in the 19th century section is the one by Lovejoy entitled "The Argument for Organic Evolution before the *Origin of Species,* 1839-1858." As a result, in 1844 Robert Chambers' *Vestiges of the Natural History of Creation* could bring together the essential evidence, could be widely read and hotly debated—yet without convincing any but a few of the scientists of the period. It is too bad that the editors did not include an essay in which an attempt was made to analyze this lag in terms of general principles rather than simply through the historical facts. Such a paper would perhaps have made a fitting conclusion for the whole volume and could have shed greater light on why it was Darwin's mind and not Chambers' that contained the truly fertile pattern.

If one aspect of this book were to be singled out as the weakest one, it would be those papers which deal primarily with philosophical thought concerning evolution. Lovejoy deals with Kant, Herder, and Schopenhauer; Lester G. Crocker writes on Diderot. Crocker's chapter is the best of the four. The disappointing treatment of three German philosophers is odd, especially in that Temkin's paper, "The Idea of Descent in Post-Romantic German Biology: 1848-1858," points out that Romantic philosophy and its offshoot, *Naturphilosophie,* were influential in establishing the general concept of transformism in 19th century German biological thought. By way of omission, in view of the widespread neglect of Herbert Spencer it might have been useful to devote a chapter primarily to him and his antecedents.

But the editors have entered so frank and winning a disclaimer in the Preface, saying that the book has grown in "a somewhat haphazard way governed by individual predilections," which explains "its obvious omissions and lapses" but affords the advantage of "the enthusiasms with which the several authors have treated their chosen topics," that it would be absurd and unjust to hold, for purposes of criticism, that any single volume could possibly have appeared without drastic gaps. Looked at from a different perspective, this means that *Forerunners of Darwin* helps fill the blank spaces left by other volumes of this Darwin year.

SILVANO ARIETI, Ed. *American Handbook of Psychiatry*. New York, Basic Books, Inc., 1959. xxx, 2098 pp. $25.

Reviewed by the EDITOR.

THIS monumental compilation of well over 2,000 pages by 100 well-chosen American authors will stand as an enduring landmark in the history of American psychiatry. It has been brought out under the skillful hand of Silvano Arieti, Associate Professor of Psychiatry at the New York State College of Medicine, with the assistance of an Editorial Board made up of Kenneth E. Appel, Daniel Blain, Norman Cameron, Kurt Goldstein, and Lawrence C. Kolb.

A book of this character would not ordinarily be reviewed in the columns of this journal were it not for the first two authoritative historical chapters, the first by Nolan D. C. Lewis "American psychiatry from its beginnings to World War II," and George Mora's informative discourse, "Recent American psychiatric developments (since 1939)." In addition to these two assigned historical chapters, the majority of contributing authors have developed their subjects on historical lines. In view of this fact and the full bibliographies that accompany each chapter, plus the accurate author index and well-planned subject index of 80 pages (which incidentally will be a most useful guide to library 'subject-cataloguers' already distracted by this rapidly expanding field), this book will be an invaluable historical reference source for many years to come. The only essential thing that the book really lacks is an index to the bewildering number of highly special psychiatric terms which our colleagues in psychiatry seem to have a genius for coining. Expense was saved in the production of the book by inclusion of a minimal number of illustrations, except for Professor Papez' chapter on neuroanatomy which has 16 well-chosen illustrations, some designed by Papez himself. There are also a few illustrations in Part Eight on organic conditions. The illustrations are numbered individually in each chapter.

Although Nolan Lewis has compressed an immense amount of valuable historical material into his 15 pages of text, many of the 18th and early 19th century names in early American psychiatry are missing, this no doubt for reasons of space restriction. In passing one might express regret that Professor Loutit did not live to make use of his remarkable collection on the history of early American psychiatry.*

George Mora in his chapter has brought to bear objectivity and reasoned judgment in writing about recent developments of the subject in this, his adopted country. In his 29 pages he divides his subject as follows: General trends of psychiatry (including national recognition of the subject), The mental health movement, Research and methodology, Psychopathol-

* For the record, Dr. Richard A. Hunter, the British collector and historian of psychiatry, permits me to record that he has recently acquired Professor Loutit's library from his son, and it is hoped that Dr. Hunter will be able to use these unique materials at some future date.

ogy, The psychoanalytic movement (which occupies 6 of his 29 pages), Therapy (five pages), Developments in in-patient and out-patient facilities, Special and collateral fields of psychiatry, Psychiatric education, American and European psychiatry: an appraisal (perhaps his most interesting section), and finally, An over-all view of modern American psychiatry in which the far-reaching influence of Freud is stressed. Dr. Mora's bibliography of the 20-year period covered runs to 177 entries.

Speaking generally of the book, both as an historical reference source and as a current handbook for the practising psychiatrist, one can say that it is well planned and well balanced, with due attention given to the basic organic backgrounds of the great subject; thus Part Ten on Psychoanalytic Therapies, made up of five chapters, is admirably restrained, extending to only 67 pages. Perhaps the most disappointing part of the book is Part Eleven on The Physical Therapies, extending to 77 pages, in which all the chapters seem to be 'dated,' psychosurgery as of 15 years ago and the references on drug therapy all of the early '50s, the latest being 1955, while the great and enduring developments of neuropharmacology and the correlation of action of specific drugs on specific centres of the limbic system (MacLean's 'visceral brain') are completely overlooked.

One of the most thoughtful chapters in the book is that, already mentioned, by the late James Papez, ably brought up to date by Talmage L. Peele. The chapter on Neurophysiology: Brain and Behavior is one of generalities having little reference to the underlying neurophysiology of mental disease. One of the most interesting sections is Part Thirteen: Contributions from Related Fields, especially the four sections on Religion, Avrum Ben-Avi's contribution on page 1816, and that on Zen Buddhism. To refer kindly to Chapter 87, Mathematics and Cybernetics, except perhaps for the brief section on Information Theory, would be to term it unmitigated balderdash, quite unworthy of a serious treatise on American psychiatry. Apart from these regrettable flaws the monograph can be recommended as an indispensable reference tool for all libraries of the history of medicine.

LUIGI BELLONI. *La medicina a Milano fino al Seicento.* In: *Storia di Milano* (Milano, Fondazione Treccani degli Alfieri), Volume XI, Parte XII, 1958, pp. 595-696.

Reviewed by DOROTHY M. SCHULLIAN, *Editor, Notes and Events.*

THIS history of medicine in Milano through the 17th century, publication of which was announced in the Journal, 1959, *14*, 545, is the first of two installments; the second, covering the 18th and 19th centuries, is due to appear in another of the 16 volumes, written by approximately one hundred collaborators, which will carry the comprehensive history of St. Ambrose's great city from its beginnings to the year 1914. Their handsome format continues a tradition established by Senator Giovanni Treccani

degli Alfieri in the publication of the *Enciclopedia italiana.* In scholarship also they rival the standard attained there. The final volume will contain a master index of all names which have appeared in the preceding volumes and a master bibliography of all works which have been cited in the footnotes.

Anyone familiar with Professor Belloni's many contributions to the history of medicine will expect and will find the same high quality in this survey of the medicine of his native city. Recognizing that the history of medicine for any one city must display a certain lack of continuity because medicine's development was and is rather a process spread over many cities and countries, he is able nonetheless to trace an organic character in Milanese medicine from the middle of the 14th century on. Two important subjects, the pest and hospitals, he neglects because these have been discussed elsewhere in the *Storia di Milano.* His introduction, after a salute to his predecessor Bartolomeo Corte, whose *Notizie istoriche intorno a' medici scrittori milanesi* . . . was published in 1718, examines in particular the relations of Giovanni da Milano with the School of Salerno. The following chapters (II-V) are devoted respectively to physicians, surgery, anatomy, and pharmacy. Each treats its subject chronologically; many less familiar names are here together with the greater, and special attention is paid to the colleges, statutes, duties, and privileges of physicians, surgeons, and pharmacists. Of necessity the district surrounding Milano is included; the notable influence of Pavia is justly prominent, and Gaspare Aselli, who on 23 July 1622 discovered the lacteals, was, it will be remembered, originally from Cremona. The phenomenon of families which furnish more than one outstanding physician to the annals of their city is illustrated in Milano by the houses of Casati and Settala. And Milano provides two singular figures, uniquely her own and unique in fame, in Gerolamo Cardano and San Carlo Borromeo.

This history is written in a simple and concise style which is the essence of clarity. The *Storia di Milano* carries no headlines, and they are not needed, for the reader has a far more convenient guide in the indented paragraph legends, printed in italic type, which provide a useful outline to the whole. There is nothing superfluous in the text; this is a survey into which a great mass of information had to be tightly packed. The sketches are, however, more than thumb-nail sketches; they are united by the common bond of the evolution in medicine which they demonstrate and they form an appealing narrative. In two outstanding respects these pages transcend the common notion of a survey. The author, constantly aware of the importance of primary sources, goes directly to the manuscripts and documents, furnishing in some cases source studies which had not been published previously. He also documents his statements fully from the secondary literature on his subject, whether published in Italy, elsewhere in Europe, or in America, and whether published in books and

journals commonly known to medical historians or in organs usually seen only by general historians. The documentation is fully set down, with abundant cross references, in the two-columned footnotes to each page which occupy sometimes an entire half of the page. There are, it may be added, frequent quotations from the Latin, which is clearly and rightly expected to fall within the serious reader's competence.

It must be a great joy to an author to be permitted the lavish use of illustration which was allowed here. In addition to the numerous smaller cuts throughout, all of which are closely related to the text which they interpret, there are 14 full-page illustrations in black and white and six in faithfully reproduced color, including Plates I and II from Aselli (1627) and folio 1a of Volume I from the copy of the *Practica medicinae* (1472) of Giammatteo Ferrari di Gradi in the National Library of Medicine.

The second installment of this history will be eagerly awaited.

CHARLES GALLENKAMP. *Maya. The Riddle and Rediscovery of a Lost Civilization.* Drawings by John Skolle. New York, David McKay Co. Inc., 1959. xvi, 240 pp., illus. $5.50.

Reviewed by FRANCISCO GUERRA, *Research Associate, Department of the History of Medicine, Yale University School of Medicine.*

FROM the early days of Spanish colonization, when Padre Diego de Landa wrote his *Relación de las Cosas de Yucatán,* to the more recent work by Sylvanus G. Morley, *The Ancient Maya,* many a historian has been fascinated by the same question: How was it possible for a civilization such as that of the Maya, which produced such magnificent religious architecture and art and such accurate concepts of astronomy and mathematics from 325 to 1200 A.D., to attain such a degree of magnificence, when basic knowledge about the domestication of animals, metal tools, agricultural development, and the principle of the wheel seems to have been totally lacking?

The interest and value of Gallenkamp's book lies in his ability to relate how the Mayan archeological remains were rediscovered, from the early descriptions of P. Landa in the 16th century and of Captain Antonio del Río in the 18th century, to the relatively modern accounts supplied by Stephens, Brasseur de Bourbourg, Maudslay, Morley, Thompson, or Jakeman. These authors described the problems encountered in the study of the history and culture of the American groups which populated Central America and built cities with religious architecture which may be seen at Copán (Honduras), Piedras Negras and Petén Itzá (Guatemala), and Palenque, Bonampak, Mayapan, Uxmal or Chichén Itzá (Mexico). The excellent résumé provided by Gallenkamp has been obtained by quoting and commenting on six or seven major classics which provide a comprehensive account of Mayan culture. However, many subjects, such as the process of the evolution of corn, which is so integral a part of the Mayan

civilization, are not even mentioned. Medical knowledge among the Maya is dismissed in a mere five lines, and there is no mention of the works by Léon (1920), Soto Hall (1938), Souza Novelo (1940), or Steggerda and Korsch (1943).

This reflection brings us to the question of the extent to which Mayan medicine has been studied from original source, and to the personal experience of the writer in this field over the last twenty years. Three types of source can be described which offer information about this fascinating subject. In the first place, there is the material written prior to the Spanish conquest, which survived in codices such as the Dresden, Tro-Cortesianus, and Peresianus, as well as that on carved stones and painted murals. These are mainly concerned with concepts of chronology, astronomy, and Mayan theology, and after some preliminary study years ago, hope that here might be found some important contribution pertaining to medicine was reluctantly abandoned. It should be borne in mind, however, that the ideographic or hieroglyphic interpretation of Mayan writing is still in the initial stages and that no significant advance has been made since the writings of Landa in the 16th century.

The other type of documents is post-Cortesian and makes use of a phonetic Mayan writing. Some documents of this kind are of a general nature, such as the *Popol Vuh,* and contain information of interest to medical history relating to epidemics which affected the history of the Maya. The *Popol Vuh* has been translated and is readily available. However, the most interesting Mayan Codex in phonetic writing is the book of the *Chilam Balam of Ixil.* Although there are some good Maya-Spanish dictionaries, the translation of this Codex proceeded painfully slowly until competent assistance was obtained from Professor A. Barrera Vasquez. According to a study which is awaiting publication, this Codex was written towards the end of the 18th century and has been debased by the influence of European ideas. This is a remarkable difference, in view of the fact that a similar product of Aztec culture, the Badianus Codex, which was translated and published by the reviewer in 1952, was written in 1552 and shows no signs of European influences. Two other medical codices have been found in Mayan phonetic writing and will shortly be studied in conjunction with the *Ixil.*

The third type of document available for the study of Mayan medicine is a group of manuscripts and printed material, which have deteriorated very much from the original sources. These are written in Spanish and include works such as the book of receipts by P. F. X. Ramirez, J. Martin y Espinosa de los Monteros, and the Dondé brothers.

The most striking factor which emerges from deciphering hieroglyphic documents or translating phonetic documents is the absolute dominion of the concept of time in Mayan life. Almost half of the book of the *Chilam Balam of Ixil* is devoted to a discussion of chronology. The other factor,

more interesting from the medical standpoint, is the Mayan dependence on botanical material for the treatment of diseases. In this respect the work of Roys (1931) on the ethnobotany of the Maya is of major importance.

A last comment to be made by the medical historian regarding the decline and fall of the Maya is the notion, encountered in the correspondence between Bishop Carrillo Ancona and Carlos Finlay, that endemic malaria or yellow fever might account for the extinction of the Mayan civilisation, in the same way that malaria is supposed to have contributed to the decline of the Etruscan civilization. Recent archeological studies seem to prefer the theory of a revolt of the people against their theocratic rulers. This could also account for the lack of cultural manifestation after the New Empire, in 1200 A.D., when the influence of the theocratic rulers, who were also the enlightened class, seems to have been almost entirely lacking in Mayan life.

Gallenkamp leaves himself open to question as a student capable of narrating the progress of exploration and of synthesising the problems confronting scholars who study the Maya in the first chapter of his book, where he follows the Hollywood version of the Conquistadors' lust for gold, and makes unfounded statements about the Spanish Conquest which are sandwiched between quotations from a respected author such as Prescott and the perennially fresh account of the Conquest by Bernal Díaz del Castillo. At the time of the Conquest, there was barely enough gold in the Yucatán to make a bracelet, let alone justify Gallenkamp's account.

After reading this account of events culled from various authors, it is apparent that not one author has managed to equal the fresh touch and charming style of the companion of Cortés, Bernal Díaz del Castillo, who, at the age of eighty, when he was deaf, almost blind, and in the throes of poverty, wrote the most beautiful account of the fight against the Aztecs and the Maya—"The True Account of the Discovery and Conquest of Mexico"—which is still a 'best seller' in Americana.

ENRIQUE LAVAL M. *Noticias sobre los Médicos en Chile en los Siglos XVI, XVII y XVIII.* Universidad de Chile. Centro de Investigación de Historia de la Medicina. Santiago, 1958. 137 pp.

Reviewed by FRANCISCO GUERRA, *Research Associate, Department of the History of Medicine, Yale University School of Medicine.*

AT the close of 1957, the continual endeavour of Dr. E. Laval M. in the field of the history of medicine in Chile resulted in the foundation of a Research Centre for the History of Medicine in the National University of Chile, in which project Dr. Claudio Costa had been working in close collaboration with Dr. Laval. The latter has published several works in this field, among them an exhaustive monograph on the "Jesuits' Pharmacy in Santiago" during the Colonial Period (1953).

Dr. Laval's work on Chile's physicians is the result of more than thirty years of research in the archives of Chile and other countries. The subject has been previously treated by Vicuña MacKenna (1877), the bibliographer Medina (1928), and several other writers. However, in order fully to appreciate the original contribution which has been made by Dr. Laval, it should be pointed out that in the work of A. Fuenzalida Garzón, *Historia del desarrollo intelectual en Chile* (1903), 72 Chilean physicians are recorded up to the 19th century, and the classic book by P. L. Ferrer, *Historia de la Medicina en Chile* (1904), only offers information on 99 physicians for the same period. Dr. Laval as accumulated biographical and bibliographical material of about 158 physicians in Chile up to the close of the 18th century.

Laval's work is preceded by a study of the accepted rules for medical practice in Spain and the Spanish-dominated countries in America, and this is followed by a list, arranged according to century and alphabetical order, of every recorded practitioner. A chronological list of these medical practitioners is to found at the end of the volume. The material presented is significant and provides accurate information for the medical historian, not only of Chilean medicine, but also of medical practice in the neighbouring countries. It should be emphasised that most of this material has never before been made available, and that most of the references have been culled from the original archives of the colonial period. Some of the physicians are discussed in considerable detail, as for instance in the case of P. Chaparro, where an account of inoculation and later of vaccination for smallpox is presented, leading up to the arrival in Chile of the famous vaccine expedition of Balmis and Salvany (1803-1806).

A. M. Lassek. *Human Dissection: Its Drama and Struggle.* Springfield, Illinois, Charles C Thomas, 1958. x, 310 pp., illus. $6.50.

Reviewed by Charles Donald O'Malley, *Professor of Medical History, Division of Medical History, University of California at Los Angeles.*

Dr. Lassek's book attempts to cover the entire history of human dissection from primitive times to the present, but since somewhat more than half the book deals with the period prior to 1600, it may be assumed that the author's interest lies chiefly in the foundations of the "art." Unfortunately, any proper consideration of even this period would require a more extensive presentation than has been made here, while the long but undiscriminating bibliography appended to the text indicates that the author restricted, or was compelled to restrict, his reading to books and articles in English, hardly the best preparation for his task. The period after 1600 suffers badly from lack of balance in presentation since, for example, an entire chapter is devoted to the "resurrectionists," but curiously there is no mention of the anatomical activities of Bartholin, Steno, Wirsung, Vesling, Casserius, Spigelius, Riolan, or Eustachius. Only in the final part of the book, that dealing with the English-speaking world, is the text less

subject to criticism, this possibly due to the author's easier access to necessary source and secondary materials. However, since the bulk of the work deals with the earlier period, such praise is somewhat less than a full recommendation for Dr. Lassek's study.

Because of the authority of the printed word and in view of the very numerous errors of fact in Dr. Lassek's book, the reader must employ great caution. The following statements taken from pages 57-105 are all erroneous: the works of Galen were "widely translated and published through the 16th century from Greek to Latin, Arabic and Hebrew"; the *Canon* of Avicenna is "more lucidly written than Galen's Anatomy and it overshadowed the latter's authority for four centuries"; Mondino "definitely forms a link between medieval anatomy and Vesalius"; Mondino "offered nothing new over Galen or Avicenna"; "Before Vesalius, neither teacher nor student touched the cadaver"; "between 1400 and 1543, more anatomies were probably made by artists than by anatomists"; the artists "were greatly responsible for advancing the study of all forms of human anatomy"; Leonardo's "interest in anatomy, which began at the age of seventeen"; Leonardo "spent thirteen years, between the ages of seventeen and thirty" at the hospital of Santa Maria Nuova in Florence; Leonardo "apparently obtained all the material he needed" for human dissection in Milan; "Alessandro Achillini. . . (A.D. 1463-1525)"; "A magnificent anatomical theatre . . . was built [at Padua] in 1446, some say at the personal expense of Fabricius (1537-1617)"; "Realdus Columbus . . . published a treatise on the lesser circulation, *De re anatomica*"; "It was at this time [mid-16 century] that anatomists began to dissect on their own, taking over this duty from the barbers"; "Sylvius introduced the art [of dissection] in Paris"; "No exact date can be ascribed to the founding of the University of Paris"; "Historians credit [Sylvius] with being the first in Paris to dissect man"; [Sylvius] reopened his classes at Tregiurer [*sic*]"; "Like his predecessors [Sylvius] taught anatomy from the chair"; "[Vesalius] studied under [Sylvius] for three years, during which time he laid the foundation for his famous *Fabrica*"; "[Sylvius] was the first to dissect the human cadaver in Paris"; "Probably more has been written about Michael Servetus . . . than any other medical man of the Renaissance period"; "[Servetus] pursued some original anatomical investigations on the human body while [in Paris]"; "[Servetus] was a fellow dissector with Andreas Vesalius"; "[Servetus's] first book being *Apology to Astrology*"; Servetus's account of the pulmonary circulation is in the "fifth volume of his *Christianismi Restitutio*"; "The book was suppressed by the Church"; "Servetus . . . was burned at the stake . . . with 1000 copies of his condemned book"; "Berengario da Carpi . . . cannot be placed in any one school, because he was a member of the faculties at both Pavia and Bologna"; "At first, [Vesalius] tried to learn anatomy by reading several texts (Albertus Magnus and Michael Scatus [*sic*])"; "He ventured on a practical program of dissection, obtaining animals which were easy to catch; mice, moles, rats, dogs and

cats"; "[Vesalius] dissecting down to the bones, with Servetus"; " . . . it was not long before [Vesalius] was put in charge of dissections [at Paris]"; "After [Vesalius's] studies at the University of Paris were completed (1536)"; "At least one time, [Vesalius] was questioned for having [human bones] in his home, by the police"; " . . . anatomy . . . was actually encouraged, particularly by a group of Theatin monks, established in Italy in 1524. . . . In Venice, they devoted themselves to the care of the sick which accounts for their interest in anatomy. One of the co-leaders of the organization was the famous Ignatius Loyola, founder of the Jesuits"; "During the last month of the year, 1537, Vesalius moved to Padua in order to gain all the rights and privileges of a full-fledged physician"; "Three years of arduous labor were spent in completing [the *Fabrica*] according to the standards of three individuals: Andreas Vesalius, . . . Jan Stephan van Calcar . . . Johannes Oporinus"; "For many years, it was assumed that Titian was the artist in question rather than Calcar, his favorite pupil, but this has been settled in favor of the latter"; "The text [of the *Fabrica*] is lucid and yet succinct"; "The osseous system, as a whole, is described correctly for the first time"; "[Vesalius] describes the arteries and veins adequately"; "Considering the period, Vesalius' work on the nervous system was surpassing and elaborately minute"; "Vesalius went to Pisa early in 1544 . . . from there, he moved to Bologna"; "[Vesalius] accepted the appointment of military surgeon to Charles V of Spain which necessitated a shift in residence to Madrid"; "There were those, however, who had chosen Vesalius' way of teaching anatomy . . . Massa"; "The [letter] often quoted [regarding Vesalius's pilgrimage] is based on a letter written by Herbert Languer [*sic*]"; "One thing is really known for certain and that is that the voyage was made, the Holy Sepulchre visited, both against the wishes of Vesalius."

These are by no means all the errors of fact to be found in a space of approximately fifty pages, and, furthermore, it will be observed that in some instances there are two errors in one statement. However, such a selection ought to be sufficient to cause one to look with some dubiety upon the value of the book.

CARLOS MARTINEZ DURAN. *Federico Chopin o el triunfo del espíritu sobre la carne.* Colección de autores guatemalenses "Carlos Wyld Ospina." Guatemala, Universidad de San Carlos de Guatemala, 1958. 266 pp., illus.

Reviewed by FRANCISCO GUERRA, *Research Associate, Department of the History of Medicine, Yale University School of Medicine.*

THE early works of Dr. Martinez Duran are now being published. As in his classic "History of the Medical Sciences in Guatemala," which has now exhausted its second edition, Dr. Martinez Duran displays his unique style, for he is without doubt one of the most distinguished medical writers in Spanish and a fine university teacher in the great tradition.

The author, who is President of the Universidad de San Carlos in Guatemala (founded in 1676), has been, with Asturias and Figueroa, an historian of medicine in Central America, and for many years professor of pathology in the Medical School of Guatemala. Thanks to his continuous support, a chair of the history of medicine, which he fills with distinction, has been established and he has instituted reforms for the broadening of medical education.

This biography of Frederick Chopin is essentially a description of a sentimental journey made by Martinez Duran, in the course of which the author visited every place connected with the life, loves, and works of Chopin (1810-1849)—with perhaps the sole exception of Warsaw. However, this biography is not merely the literary effusion of one romantic on another of the species; the theme upon which the author lays emphasis is that Chopin could in no sense be considered to have had his talents appreciably limited, or his life destroyed, by disease and he thus became the exception proving the general truth of van Weizsäcer's thesis, namely, that disease is above all the loss of human freedom to material limitations.

The character studied and that of the author are well matched, and the expressive prose of Martinez Duran contains as much passion as the music of Chopin. On the other hand, the author is conscientious in adhering to the truth about the life of his subject. This work, which is the result of extensive reading, travelling, and study of the works of Chopin, is in keeping with the motto which the traveller will find inscribed over the door of the 'Finca Leuconoe'—the author's home—where is written, freely translated from the Latin, "Love, and do as you please." This doctrine has been subscribed to by writers as varied as St. Augustine, Rabelais, and Martinez Duran, though it should be admitted that each offers a widely differing and personal interpretation of this tenet.

WALTER A. WELLS. *A Doctor's Life of John Keats.* New York, Vantage Press, 1959. 247 pp. $3.95.

Reviewed by HENRY R. VIETS, *Curator, Boston Medical Library, Boston, Massachusetts.*

ALL the known facts regarding the preliminary training and medical school days of John Keats could be readily set out on one or two sheets of paper and another page would be sufficient to cover an account of the symptoms and course of the fulminating pulmonary tuberculosis which caused his death at the age of 26 in 1821. Osler, in his address before the Johns Hopkins Hospital Historical Club, 29 October 1895, on the centenary of Keats' birth, had to base his discourse on scanty bits of information regarding the apprenticeship with Thomas Hammond, the Edmonton surgeon, and scarcely more about the student days at Guy's Hospital Medical School from 1815 to 1817 and the 12 months as dresser under Mr. Lucas. Keats obtained the minimum qualifications from the licensing

board of Apothecary's Hall before the completion of his 21st year. This endorsement gave him the right to practise medicine, but he never made any effort to establish himself. Almost at once he abandoned the profession, apparently not without some opposition by his friends; in subsequent years he only sporadically toyed with the idea of resuming a medical career. After 1817, to use his own words, he lead "a fitful life, here and there, no anchor." There are few indications of any impact of his professional training in Keats's letters, fewer still in his immortal poems.

We know more about his terminal illness—the probable infection from his mother in 1810, the re-infection from brother Tom in 1817-18, the first symptoms of tracheal involvement in 1818, his subsequent frequent hemoptysis, the slow wasting and weakness, his "damned moments," and finally his death in Rome, 27 February 1821. Even Osler could barely stretch the story to 18 pages; Bett's satisfying summary in *The Infirmities of Genius* (1952) is compressed into eight.

In recent times we have added Keats's *Anatomical and Physiological Note Book* (1934), but these notes provide meager fare. Hale-White in *Guy's Hospital Reports* for 1925 and in *Keats as Doctor and Patient* (1938) gives the authoritative record and the general atmosphere in which Keats worked during his medical student days. The recorded facts offer few pegs on which to hang a lengthy medical biography.

Wells covers the same ground, taking nearly 250 pages to traverse the familiar road. Not so alert as his predecessors, he misses much and on occasions almost loses his way by wandering off into by-paths of misty history. Some might forgive him for writing "St. Thomas" for "St. Thomas's Hospital," although it was so founded in 1215, but to refer to "Guy's Hospital" as "Guys" is inexcusable. The book contains a few well-written passages, but many are slangy, devious, or redundant. Although nothing has been added in this book to the medical literature on Keats, one still gets enormous satisfaction from Keats's letters and poems, which Wells produces freely. Wells gives no references or identification of quotations; there is no index.

In his happiest days Keats must have been a "jolly fellow who could not only carry his splendid burthen of genius, but," as Bernard Shaw wrote, "swing it round, toss it up and catch it again, and whistle a tune as he strode along." Even a badly written book cannot dim that picture.

ALBERT G. LOVE, EUGENE L. HAMILTON, AND IDA L. HELLMAN. *Tabulating Equipment and Army Medical Statistics.* Washington, D. C., Government Printing Office, 1958. x, 202 pp. $2.00.

Reviewed by ROBERT J. T. JOY, *Captain, MC, USA, United States Army Medical Research Laboratory, Fort Knox, Kentucky.*

HIDDEN behind this forbidding title is a delightful historical monograph. General Love and his co-authors have here recorded the history of the

development of Army Medical Corps statistics and of the IBM punchcard machines. For 15 years (1917-1932), the senior author was either in charge of the Medical Statistics Section of the Army Surgeon General's Office or doing biometric research in association with that section. He has worked closely with the SGO since 1932 and is thus able to leave us a vivid personal record of the early history of the collection and use of statistical and anthropometric data.

There is an introductory chapter on the history of the Army Medical Department, followed by one detailing the beginning of medical record collecting in the Army. The history of the invention, development, and use of electrical tabulating machines is better told here than any place previously known to me. Col. John Shaw Billings suggested the need for such machines in 1880, but to Dr. Herman Hollerith must be given full credit for developing the thought into a functional electrical sorting and tabulating system. Although an early punched card system was used in Baltimore in 1886, the first major testing was done in the Medical Statistics Section of the SGO early in 1889. From experience gained there, it was possible for Dr. Hollerith to compete successfully in the 1889 tests for the Census Office, so that the 1890 census was tabulated with his punched card sorting machines. From this system the present-day IBM corporation grew.

Several chapters are devoted to the story of the collection and use of medical statistics in World War I. These are followed by the sad tale of lost opportunities in World War II when, due to administrative and financial problems, the proper tabulating of complete biometric data was not done—and has not yet been fully accomplished due to the current economy measures in Government.

There are many illustrations of the early accounting and tabulating machines and cards. A unique feature is the reproduction of the various forms used to record military medical statistics. Those of us who have to complete them may groan from time to time, but here is evidence that they have improved.

This book will be of interest to all medical historians, but will be of particular value to people interested in medical statistics and military medicine.

ROBERT O. STEUER AND J. B. DEC. M. SAUNDERS. *Ancient Egyptian & Cnidian Medicine. The Relationship of Their Aetiological Concepts of Disease.* Berkeley and Los Angeles, 1959. 104 pp. $3.00.

Reviewed by JOZEF M. A. JANSSEN, *Editor of the Egyptological abstracts sponsored by the International Association of Egyptologists, Leiden (Netherlands).*

EGYPTOLOGY covers a wide field, not only chronologically but also because it deals with so many and such varied subjects. It includes the study of

the successive stages of the Egyptian language, the development of religion and art, of manners and customs, domestication and breeding of animals, the political and economic history of about thirty centuries of human toiling, as well as Pharaonic medicine, famous in antiquity.

Although only a few medical papyri have been published during these last years (by J. W. B. Barns, *Five Ramesseum Papyri,* Oxford, 1956), the study of the known material has produced, especially since World War II, a great number of articles and books. We owe many of them to the surgeon-Egyptologist Frans Jonckheere of Brussels to whose memory the present book has been dedicated, and it may be expected that the work of the Berlin school of Egyptology will stimulate again the interest in Egyptian medicine. The philological *Altmeister,* Hermann Grapow, and his team are publishing a *Grundriss* and in four years (1954-1958) six volumes have come out. In three volumes of this work they present both in German translation and in hieroglyphs the available medical texts of ancient Egypt. In doing so, they give the scholars who are not professional Egyptologists a *corpus* of otherwise widespread sources and a solid foundation upon which to work.

The book I have the honour to present here deals with another aspect of Egyptian medicine: its influence on the medical practitioners of Cnidus. This town has given us the famous statue of Demeter, now in the British Museum, "thence, also, came Ctesias, who served Artaxerxes (the Persian king) as physician and wrote the works entitled *Assyrica* and *Persica,*" as Strabo informs us in his *Geography* (14.2.15=Cas. 656). It is a curious coincidence that, just like the authors of the present book, Ctesias was interested in history and at the same time was a famous representative of the Cnidian school of medicine.

First, Steuer reviews his ideas about the concept of *whḍw* or pyaemia as an aetiological agent in ancient Egyptian medicine, published *in extenso* in 1948. Although this Egyptian concept possesses some resemblance to the ideas on the corruption of blood expressed by Aristotle, in this earlier study more definite relationship with early Greek medicine could not be established. The present monograph bridges the gap between the ancient Egyptian and early Greek thought on the aetiology of disease. The crucial term *perittōma,* which is of outstanding aetiological importance in the *Papyrus Anonymus Londinensis,* is investigated at length. The present study in no way attempts to refute the etymological meaning of *perittōma* as superfluity, overabundance, or excess and its interpretation as superfluous (overabundant) indigested food or residue in accordance with the literal meaning of the term. Now the Cnidian school considered the rising of *perittōma* or its derivatives as the cause of disease. And the movement of fecal matter in the body, especially *whḍw* as its very essence, has proved to be of decisive influence in the attempt to find the immediate link connecting Greek and Egyptian ideas on aetiology. The movement of *whḍw* was thought to

be not only downward toward the legs, but also upward in the direction of the heart. The center from which *wḫdw* moves up and down is evidently the intestines, and the movements of *wḫdw*, potentially convertible into pus, are mainly limited to the blood-conveying vessels. The opinions of the founder of the Cnidian School, Euryphon (middle of the 5th century B.C.) represent only the crudest expression of limited aspects of the aetiological theory of *wḫdw*. The most immediate connecting link between ancient Egyptian and Cnidian aetiology is the belief in the rising of fecal excrements in the body as the primary cause of disease and, intimately related to this belief, fundamental views on putrefaction that in turn lie at the root of the early *perittōma* concept. However, it is impossible to determine whether Euryphon obtained these views by hearsay or from written sources.

There are two appendixes: the first deals with Galen's interpretation of *perittōma* and of *miasmata;* the other considers the problematical relationship between the concepts of *miasmata* in ancient Egypt and Greece. After the notes, put together at the end, follow a bibliography, an index of Egyptian words, and a general index.

Thirty years ago, J. H. Breasted published the famous *Edwin Smith Surgical Papyrus* (Chicago, Ill., 1930). Copies of this outstanding book are still available. On the other hand, the book under review has already been completely sold out.* This fact is more eloquent than the eulogies of a reviewer. Since one could think that this success has been possible by a lowering of scientific standards, the reviewer would like to point out the high scientific level of the book: for if one compares, e.g., the transcription of the hieratic Papyrus Berlin, XIII, 3-7, on page 37, with the text as reproduced by Hermann Grapow *(Die medizinischen Texte in hieroglyphischer Umschreibung autographiert,* Berlin, 1958, pages 182-183), the former is much to be preferred. Just one remark: the representation of a seated man on the cover and on the title-page is very poor. For the rest, both the authors and the press are to be congratulated for such a fine book.

* It is a pleasure to tell that the handy and very neat booklet has been reprinted so that copies of it are again available.

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ISIS

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It is with sadness and profound regret that we announce the death on 29 May 1960 of JOHN F. FULTON, Editor of this Journal since 1951 when it was taken over by the Department of the History of Medicine at Yale from its founder-publisher, Henry Schuman.

John Fulton's breadth of interests and competence in several fields other than neurophysiology gave him unique qualifications for editorship. His love of medical history, fostered in his student days by Sir Charles Sherrington, by W. W. Francis and the books of Sir William Osler, and by Edward Clark Streeter and Harvey Cushing, grew into wide knowledge through his collecting of the great milestones in physiology and medicine throughout his life.

He was always somewhat diffident about his qualifications as a medical historian, but few have done more than John Fulton as humanist and scholar to arouse interest in medical history or to encourage those working in the field. Meticulous in his standards of scholarship, generous in sharing his books and learning, warm-hearted and loyal in friendship, he has left us an example which will endure as long as man's search for truth.

THE EDITORS

John Donne and William Harvey

F. N. L. POYNTER*

IT is strange that among the hundreds of scholars who have studied the life and work of two such celebrated Englishmen as Donne and Harvey not one seems to have considered a possible connection between them. As Donne so truly said, "no man is an island," and if we are investigating the factors which influenced the character and thought of either Harvey or Donne we have to remind ourselves that each was a part of the other's environment. Did they know each other? History rarely provides a simple answer to a simple question of this kind. We know a few of Donne's 'special friends' from Walton,[1] and Harvey is not among those named. About the first half of Harvey's life we know all too little. Ent, Scarborough, and the others who helped to immortalise his memory were the friends of his later years, but Harvey was already 53 and only six years younger than Donne when the latter died in 1631. That their paths had not crossed—and more than once—in the London of their day is difficult to credit, especially when we bring together a number of undoubted facts which, cumulatively, are of such significance that only positive documentary evidence that they were not acquainted would be strong enough to discount them. I shall set out these facts and then show how certain passages in Donne's writings suggest that he knew of or was even present at Harvey's Lumleian lectures and that Harvey had read and noted one of Donne's most remarkable works. Interesting as this may be, there are implications which have a bearing on the reception of Harvey's ideas as demonstrated in those lectures.

* * * * *

Donne's contemporaries were all greatly impressed with the wide range of his learning, and his poetry is remarkable for the transmutation of the scientific knowledge of his day into poetic images. Walton[2] records that he knew 'the grounds and use of

* Wellcome Historical Medical Library, London, England.

1 Walton, Isaac. *The lives of Dr. John Donne, Sir Henry Wotton, Mr. Richard Hooker, Mr. George Herbert.* London, 1670, *etc.*

2 Walton, Isaac. An elegie upon Dr. Donne. In *The complete poetry and selected prose of John Donne. Edited, with an introduction, by Charles M. Coffin.* New York, The Modern Library, 1952, p. 276, lines 46-7. Unless otherwise stated all quotations from Donne's writings in this article are taken from this edition.

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Physicke' and would have become a physician but for the mercenary aspects of the profession. Coffin[3] points out that a 'tabulation of Donne's numerous allusions to many kinds of science contains a far greater number of references to medicine than to astronomy,' a science which had a profound influence on his imagery. This wealth of medical allusion has received some attention,[4] but its true origin has not hitherto been appreciated.

John Donne was less than three years old when his father, a prosperous London merchant, died in January 1576, leaving his mother with six small children to care for. About six months later she remarried and she and her family moved into the large and comfortable house in Trinity Lane where her second husband, a widower with two married daughters and a son of about sixteen, had made his home. The man who thus became John Donne's stepfather was John Syminges,[5] a wealthy physician who was President of the College of Physicians for at least six and possibly nine years. Not only did his term of office coincide with the years of Donne's boyhood, but on at least three occasions the full Comitia of the College was held in his own house. The most notable of these three meetings was that held on 3 August 1582, at which the legal document founding the Lumleian lectures was presented for signature. It was signed by Dr. Caldwell, the joint founder, but as Lord Lumley was at Nonesuch, Dr. Marbeck and Dr. Foster were deputed, together with a notary named Morrice, to take the document from Syminges' house to Nonesuch for his signature. It would be nothing out of the way for the President to have talked of this event in his home circle and for the young Donne to have been impressed with its importance. The medical books in his stepfather's study must also have attracted his attention. He was a most precocious lad for whom any collection of books would have been a mine of hidden treasure.

Late in 1583 or early in 1584 John Syminges moved from Trinity Lane and took a house in the precincts of St. Bartholomew's Hospital, and in October 1584, Donne, then in his twelfth

[3] Coffin, C. M. *John Donne and the new philosophy*. New York, Columbia University Press, 1937. p. 24, note 1.

[4] Allen, D. C. John Donne's knowledge of Renaissance medicine. *Journal of English and Germanic Philology*, 1943, *42*, 322-342.

[5] For the information about Syminges I am indebted to the excellent account by Baird W. Whitlock: John Syminges, a poet's stepfather. *Notes and Queries*, 1954, *199*, 421-424. 465-467. This article necessitates the rewriting of all earlier accounts of Donne's childhood and early education.

year, matriculated at Hart Hall, Oxford.[6] Before he went up to the university, and during vacations for the three years he spent there, he must have acquired even a closer acquaintance with medical life and particularly with the great hospital in whose shadow he was living. After his course at Oxford he passed some years in study and travel abroad in Europe before enrolling for the law at Lincoln's Inn on 6 May 1592. In his absence, his stepfather had died, on 7 July 1588, soon after making the largest contribution of all the Bartholomew's residents to the Armada List, so that he must have died a rich man.[7]

Most of Donne's shorter poems were written in the decade which followed his return to London. Allen[8] has suggested that his interest in medicine, so obvious in the numerous medical allusions, can be traced to his own hypochondria, although anybody less like a hypochondriac than the young Donne can hardly be imagined. A layman's interest in medicine is not necessarily 'morbid' and more than sufficient stimulus for Donne's interest can surely be found in his early background, his reading of medical books (Fernel, Colombo, Paré, and Paracelsus were all familiar to him), and his one-time intention of becoming a physician himself.

His runaway marriage with the daughter of Sir George More in 1600 blighted his hopes of preferment in the state service when they were at their brightest. After many years of poverty, during which he made a profound study of theology, the splendid poem on the death of Mistress Elizabeth Drury (1611) so pleased the dead girl's father, Sir Robert Drury, that he invited him, with his family, to live in Drury House, at the Fleet Street end of the Strand, and took him with him for a nine months' tour of France and Belgium. It is in the second anniversary poem, written in 1612, that Donne speaks up for the new scientist against the old scholasticism:

> What hope have wee to know our selves, when wee
> Know not the least things, which for our use be?
> Wee see in Authors, too stiffe to recant,
> A hundred controversies of an Ant;

[6] Although it was not unusual for boys to matriculate at Oxford at the age of 14 or 15, Donne's early age was quite exceptional. It has been suggested that, as he was being brought up as a Roman Catholic, this early entry to the university would have enabled him to spend three years there and leave before it became necessary for him to take the oath of supremacy at the age of 16. This argument is supported by the fact that his younger brother Henry entered Hart Hall at the same time. There does not seem to be any evidence to support Gosse's conjecture that he was sent to the Jesuits in France for his schooling before he went to Oxford.

[7] St. Bartholomew's Hospital, Journal 3, fo. 287^{v}. Cited by Whitlock.

[8] *Loc. cit.*, p. 322.

> And yet one watches, starves, freeses, and sweats,
> To know but Catechismes and Alphabets
> Of unconcerning things, matters of fact;
> How others on our stage their parts did Act;
> What *Caesar* did, yea, and what *Cicero* said.
> Why grasse is greene, or why our blood is red,
> Are mysteries which none have reach'd unto.
> In this low forme, poore soule, what wilt thou doe?
> When wilt thou shake off this Pedantery,
> Of being taught by sense, and Fantasie?[8a]

In the same poem he shows himself aware of a physiological problem that was exercising the minds of the most intelligent physicians of the age when he asks:

> Know'st thou how blood, which to the heart doth flow,
> Doth from one ventricle to th'other goe?[8b]

Such a question could have been provoked by his own reading of Colombo and Cesalpino, but that it was in Donne's mind just at that time may indicate that some echo of Harvey's ideas had already reached him or even that he had made Harvey's acquaintance. That Harvey was already notorious in London for his argumentativeness and his dissecting is suggested by an allusion to him in some little-known satirical verses written about 1611. The anonymous author, who calls himself merely 'A Cambridge Student,' makes a scandalous attack upon each of the London physicians by name but the worst he can find to say about Harvey is:

> What ho! Doctor haruie, y^{t} are rankt among perui,
> Are you still dissecting?[8c]

* * * * *

[8a] Of the progresse of the soule. The second Anniversarie. lines 279-292. *The poems of John Donne, edited from the old editions and numerous manuscripts . . .* by Herbert J. Grierson. 2 vols. Oxford, At the Clarendon Press, 1912. vol. i, p. 259. This is the authoritative text, collated by Grierson with the first edition published in 1612. Copies of the original edition are now very rare and the British Museum has only a microfilm copy, but originals may be consulted at Yale, Harvard, in the Folger Shakespeare Library and the Huntington Library.

[8b] *Ibid,* lines 271-2.

[8c] In general these verses are an obscene libel on most of the Fellows of the College at the time. They were found in a manuscript bought in 1868 by Mr. F. W. Cosens from a bookseller at Ashton-under-Lyne. They are referred to by Henry Huth in his introduction to *Inedited poetical miscellanies,* 1870, and commented upon by W. Carew Hazlitt in his notes to that volume. They were privately printed, in 20 copies only, about 1880, with the title *Of London phisicōns. From a MS. "Poetical common place book of a Cambridge student 1611."* The copy in the Wellcome Library has been used. The lines on Harvey occur on p. 8. The word 'perui' [i.e. *parvis*] offers some difficulty. This word has a primary meaning of the court, porch or terrace in front of a church. It came to be used also of the academic conference or disputation originally held 'in parvisio.' The 'parvis' of St. Paul's was a favourite meeting place for the London lawyers where they continued their arguments out of court. In these lines the sense is extended from the place of disputation to the person disputing. It could be taken as meaning that Harvey, who had successfully argued his thesis at Padua years before, was still disputing in the same way in 1611; or, with the lawyers in mind, that Harvey was as argumentative as the crowd on the parvis of St. Paul's. This allusion is, I think, a just correction of the

If Donne had already considered taking up medicine as a profession and dropped the idea, his medical knowledge was by now an intimate part of his intellectual resources. Allen's suggestion that throughout his writing Donne is merely showing off his erudition is one which shows little acquaintance with the way in which the poet's mind works. The medical allusions are not dragged in but give the impression of a spontaneous fusion of ideas which the poet has already made his own.

Donne had by now also published theological works, some of which had attracted considerable attention, and in January 1615, at the persuasion of James I himself, he took holy orders and accepted the post of royal chaplain. In the following year he was elected divinity reader at Lincoln's Inn, a post which obliged him to deliver more than 50 sermons a year. In his new role as preacher he soon became famous as one of the most eloquent and thoughtful who had ever occupied the pulpit in England.

If Donne was thus moving closer to the deanery of St. Paul's, the College of Physicians had already done so, for in July 1614 it had taken over from the cathedral authorities its new house on Amen Corner at the end of Paternoster Row, Linacre's house in Knightrider Street having become too small for its activities. There, on 4 August 1615, William Harvey was elected the new Lumleian lecturer and in April 1616 he began the course of lectures on anatomy of which the notes have come down to us.[9] It has been many times suggested, on the strength of these lecture notes, that at this time Harvey clearly demonstrated the fact of the circulation to the College. Never has a great scientific discovery been accorded so silent a reception, judging at least by the complete absence of contemporary comment. Harvey himself, writing in 1628, reminds the President of the College that he had been demonstrating it 'for more than nine years.'[10]

view commonly held that Harvey was extremely reticent about his researches. No man of his temper and quick mind, especially when he was younger, would have been likely to have kept his ideas to himself.

Few of the other lines in this satire are quotable in polite company, but there is an interesting allusion to Dr. Argent:

"And you, Doctor Argent, wth yo^{r} notes in the margent,
you are too fat to have any skill . . ."

in which it is not medical skill which is referred to.

Of another physician mentioned in this paper, the author asks:

"Where is Doctor Clement, That's never Content,
but sherk's up and downe?"

9 Harvey, William. *Prelectiones anatomiae universalis. Edited with an autotype reproduction of the original by a committee of The Royal College of Physicians of London.* London, J. & A. Churchill, 1886.

10 *De motu cordis, etc.*, 1628. In the foreword addressed to Dr. Argent and his colleagues.

This we shall return to later, when some of the links connecting Donne with Harvey have been established. Harvey was living in Ludgate and had many patients among the nobility and gentry. In 1618 he was appointed Physician Extraordinary to James I, and would make his way up Fleet Street and the Strand, not only to the palace at Whitehall, but to see other of his noble patients in the great houses in the vicinity. Religion was as much a matter of table-talk then as politics is today, and Donne was already famous for his sermons. He had friends and former patrons among the nobility and he was much in demand at Court. Harvey was a firm Christian and for the royal physician not to have met the royal chaplain, who could tell the Lumleian lecturer and the physician at St. Bartholomew's his boyhood reminiscences of both College and hospital, would indeed be extraordinary. Especially when the chaplain was one so well read in medicine as Donne and one so fascinated by the problem of

> . . . how the blood, which to the heart doth flow,
> Doth from one ventricle to th'other goe.

Especially, too, when they had mutual friends. Donne's own physician was Simeon Fox,[11] the son of the martyrologist and one of Harvey's fellow students at Padua who signed Harvey's diploma as a witness. He held high office in the College of Physicians and was appointed to give the anatomy lectures during Harvey's absence abroad in 1630-1631. This was the man whom Donne called his "faithfull friend" and to whom Walton refers as "a man of great worth . . . who loved him [i.e. Donne] entirely." Walton also tells us that it was Fox who sent 100 marks anonymously to Donne's executors to pay for the marble bust of Donne which was made by Humphrey Mayor in 1631 and which may still be seen in St. Paul's Cathedral. Occasionally Dr. William Clement,[12] another Padua doctor and officer of the College, was also called in by Donne, to whom he was distantly related. From 1620 onwards, Clement, together with Harvey and Mayerne, was charged by the College with watching the activities of the surgeons who were seeking to influence Parliament so that their own privileges might be enlarged at the expense of the physicians.

11 See Donne's letter to Mrs. Cokain in Coffin's edition (see n. 2), p. 405. For biographical accounts of Fox see the *Dictionary of National Biography* and Munk's *Roll of the Royal College of Physicians.*

12 See Donne's letter to Mrs. Cokain, *op. cit.*, p. 411. See *DNB* and Munk for Clement also.

In 1621 James appointed Donne as Dean of St. Paul's, then, as now, a high and important office in the English Church. He had already preached at 'Paul's Cross' (on 24 March 1617), outside the cathedral and almost within the hearing of the physicians at the College on Amen Corner. Among his duties was the maintenance of the cathedral itself and its properties, and one of his first tasks was to put into complete repair the chapel attached to the deanery. He would certainly have had official business with the College of Physicians about the lease of their house, the deeds of which were held by Dr. Goulston from 1623 to 1627 as security for a mortgage.[13] In October of the latter year the President, Dr. Argent, asked him to surrender the deeds as the lease was due for renewal by the Dean and Chapter of St. Paul's. Harvey, who was Treasurer of the College in 1628 and 1629, would have been responsible for the financial transactions when the new lease was drawn up. That Donne had secured Goulston's interest in the repair of the cathedral fabric is indicated by the fact that when Goulston died in 1632 he left £20 in his will for this purpose. Theodore Goulston had close and long-standing family connections with the Church. He was himself, says Wood, "an excellent Latinist, and a noted Grecian, but better for theology, as it was observed by those who knew him."[14] Among his important patients and influential friends were George Abbot, Archbishop of Canterbury, and Sir Edwin Sandys, the joint manager of the Virginia Company. It was through his friendship with Sandys that he was appointed to the Committee of the Company on 14 June 1619, an office which he still held in 1622,[15] when, probably at Goulston's suggestion, Donne was invited to preach to the Company. Donne had long been interested in Virginia and had once applied, unsuccessfully, for the post of Secretary to the Company. Goulston was a friend and near neighbour of Harvey in Ludgate and he is mentioned in Harvey's *Prelectiones* (fo. 42^{v}). In his will he left money to found the Goulstonian lectures at the College and it was Simeon Fox, as President, who arranged with his widow the procedure for the annual payments to the lecturer. Apart from these individual links between Donne and the College, the physicians would certainly have attended services in the cathedral, both as a body, on formal occasions, and as individuals, and in the small social circle of St. Pauls' residents

[13] Keevil, J. J., Theodore Goulston, M.D., F.R.C.P., 1574-1632. *Bull. Hist. Med.*, 1953, 27, 201-211 [p. 206.]

[14] Wood, A. *Athenae Oxonienses*. 3rd ed. 4 vols. London, 1815. vol. ii, 531.

[15] Keevil, *op. cit.*, p. 205.

there must have been many occasions for accepting and returning hospitality.

Here then we have a number of links between Harvey and Donne. Donne had always been fascinated by anatomy, and dissections play an important part in his images. Laymen were often invited to the lectures in the College and, knowing what we do of Donne and his associations with the College, it would be odd if he did not make or find an opportunity to attend one or more of Harvey's lectures.

Preaching at Whitehall on 8 April 1621, to a court notorious for its gluttony and heavy drinking, Donne made use of an elaborate analogy to describe man's greed for the material things of life.

> We know the receipt, the capacity of the ventricle, the stomach of man, how much it can hold: and wee know the receipt of all the receptacles of blood, how much blood the body can have: so we do of all the other conduits and cisterns of the body. But this infinitive Hive of honey, this insatiable whirlpoole of the covetous mind, no Anatomy, no dissection hath discovered to us. When I looke into the larders, and cellars, and vaults, into the vessels of our body for drink, for blood, for urine, they are pottles, and gallons; when I looke into the furnaces of our spirits, the ventricles of the heart and of the braine, they are not thimbles: for spirituall things, the things of the next world, we have no roome; for temporall things, the things of this world, we have no bounds. How then shall this over-eater be filled with his honey?[16]

Allen referred to this passage, without quoting more than a few words from the first sentence, and commented that "this statement is probably incorrect."[17] It is true that there is little or nothing in the standard medical texts in which Allen traced parallels of Donne's medical allusions to warrant a declaration of this kind. Who, in 1621, was and had been for some years, discussing the size and capacity of the visceral organs and measuring and demonstrating the "receipt of all the receptacles of blood," including the ventricles of the heart? Nobody but William Harvey. Setting out the schedule of his anatomical work at the beginning of his lecture notes (fo. 5^{r}), he puts down 'Quantitas' as one of the five heads under which he intends to discuss the visceral organs. Lower down on the same page he lists under 'quantity,' length, breadth, size, and capacity. In a later section, where he has been demonstrating and describing the stomach (31^{r}), he has, under the heading 'Quantitas ventriculi' (cf. Donne's "capacity of the ventricle") the following:

[16] *LXXX Sermons*, London, 1640. No. 70, p. 714.
[17] *Op. cit.*, p. 333.

"Ingenti quantitate ventriculos fuisse quosdam
Helluones Gourmandisers *drinkers*
Historia veteres novae plurimae
Ex Vopisco Phago: Aurelij favorit eate
a Boar a mutton and a pigg
WH Wilkinson of Cambridg. pigg of the spitt . . .
Of Drunkerd non minor fama
Alexander sett a prise: many fell many died
Promachus victor dicitur potasse
quaturor Congij hoc 20 quarts and better . . ." and so on.

This is just the kind of thing which Donne would have stored away in his capacious memory as matter for sermons, and here already is the association with gluttony. Donne speaks of 'the larders, and cellars, and vaults . . . of our body'; Harvey calls the thorax 'the parlor' (4^{v}) and the stomach 'the kitchen' or 'shop' (8^{v}). Donne has 'the furnaces of our spirits'; Harvey talks of 'furnaces to draw away the phlegme, rayse the spirit' (24^{v}); Harvey's 'quarts' become Donne's 'pottles and gallons.' Finally, when Donne says that 'we know the receipt of all the receptacles of blood' and mentions the ventricles of the heart, we think immediately of Harvey's quantitative demonstration of the circulation, which he had already presented several times in the College and which appears in its final form in the *De motu cordis*. "Let us estimate, either theoretically or by actual testing, how much blood the left ventricle holds in its dilated state, that is, when it is full. Say this is two or three or one and a halfounces—I have found over two in a cadaver. . . ." and so on (ch. IX).

The only satisfactory explanation of the passage in Donne's sermon is that it is a reminiscence of Harvey's lectures. It was this passage and its hidden significance, which was the initial stimulus for this article and the strong circumstantial evidence brought together here for the first time tends to confirm this interpretation.

Where there is one such passage there is the possibility of finding others. Donne's sermons contain many fine things, but if there are any other hidden allusions to Harvey's lectures, they have escaped me. There is, however, a good deal of interest in the remarkable little book which Donne published in 1624 under the title "Devotions upon Emergent Occasions, and severall steps in my Sicknes: digested into 1. Meditations upon our Humane Condition. 2. Expostulations, and Debatements with God. 3. Prayers, upon the severall Occasions, to him."

Prepared for the press while Donne was on a sick-bed which he had thought would be his death-bed, after a serious illness in

December 1623, it is a book of intensely personal character and infused with a concentrated and at times agonising religious passion. If there are medical allusions and metaphors here, we can be sure that they are spontaneous enough and are indeed an ingrown part of Donne's thought. Allen describes this work as "a fine clinical account of the progress of an illness," a verdict with which I agree, but later he refers to it as "that treatise on the futility of medicine," which it is not. The physician is praised, honoured, revered, and has all the patient's sympathy and understanding (see especially the seventh Meditation). Donne's condition gave cause for such anxiety that other physicians were called into consultation, among them an unnamed royal physician who may well have been Harvey,[18] especially as Fox was in charge of the case. Meditating on this consultation, Donne writes: "They have seene me, and heard mee, arraign'd mee in these fetters, and receiv'd the *evidence;* I have cut up mine *Anatomy,* dissected my selfe, and they are gon to *read* upon me."[19]

In a later 'expostulation' he itemises his *Anatomy* and associates the College with it in a curious metaphor applied to the Trinity. He makes

> an humble confession, That there is no *veine* in mee, that is not full of the blood of thy *Son,* whom I have crucified, and Crucified againe, by multiplying many, and often repeating the same sinnes: that there is no *Artery* in me, that hath not the *spirit of error, the spirit of lust, the spirit of giddines* in it; no *bone* in me that is not hardned with the custome of *sin,* and nourished, and soupled with the *marrow* of sinn; no *sinews* [i.e. nerves], no *ligaments,* that do not tie, and chain sin and sin together. Yet, *O blessed and glorious Trinity, O holy, and whole Colledge,* and yet but one *Phisician,* if you take this confession into a *consultation,* my case is not desperate, my destruction is not *decreed . . .*[20]

At the end of Harvey's notes for his projected treatise *De motu locali animalum* which he wrote in 1627 there is a remarkable collection of 'Similitudes and analogies.' The first section exemplifies Galen's belief in the primacy of the brain, which is compared to the general, the nerve to the captains, the muscles to the soldiers, and so on. The second section, preferred by Harvey and signed with his initials, exemplifies the Aristotelean belief in the primacy of the heart. The heart is the ruler or king, the brain the judge, the

[18] John Sparrow's edition of the *Devotions* (Cambridge University Press, 1923) has a note on p. 154 stating that this was 'certainly' Mayerne, as 'he has left an account of the King's health written at the end of 1623.' There were, of course, several royal physicians and there can be no certainty about it.

[19] *Devotions,* Sparrow, Ed., p. 48. The italics here and in other quotations are in the original text.

[20] *Op. cit.,* pp. 51-52.

nerves the magistrates, etc. The analogy is pursued to include architects (—surveyors, clerks of works, workmen) and masters of ships and choirmasters in the same way.[21]

In his dedication of the *De motu cordis* to Charles I he reminds the king that the heart is "the likeness of your own royal power." In Chapter XVII he again propounds the Aristotelean concept of the primacy of the heart:

> We must equally agree with Aristotle's view about the pre-eminence of the heart, and refrain from asking if it receives movement and sensation from the brain and blood from the liver, if it is the source of the veins and of the blood and so forth. For those who attempt to refute Aristotle with such questions disregard or do not appreciate the chief point, namely, that the heart is the first part to exist and that it was the seat of blood, life, sensation and movement before either the brain or the liver had been created, or had appeared clearly, or at least had been able to perform any function. With its special organs designed for movement the heart, like some inner animal, was in place earlier. Then, with the heart created first, Nature wished the animal as a whole to be created, nourished, preserved and perfected by that organ, to be in effect its work and its dwelling-place. Just as the king has the first and highest authority in the state, so the heart governs the whole body. It is, one might say, the source and root from which in the animal all power derives, and on which all power depends.[22]

If we turn again to Donne's *Devotions,* we find the heart discussed in these terms:

> But howsoever, since the *Heart* hath the *birthright* and *Primogeniture,* and that it is *Natures eldest Sonne* in us, the part which is first borne to life in man, and that the other parts, as *younger brethren,* and servants in this family, have a dependance upon it, it is reason that the principall care bee had of it, though it bee not the strongest part; as the *eldest* is oftentimes not the strongest in the family. And since the *Braine,* and *Liver,* and *Heart,* hold not a *Triumvirate* in *Man,* a *Soveraigntie* equally shed upon them all, for his *well-being,* as the foure *Elements* doe, for his very *being,* but the *Heart* alone is in the *Principalitie,* and in the *Throne,* as *King,* the rest as *Subjects,* though in eminent *Place* and *Office,* must contribute to that, as *Children* to their *Parents,* as all persons to all kinds of *Superiours,* though oftentimes, those *Parents,* or those *Superiours,* bee not of stronger parts, than them selves that serve and obey them that are weaker. . . . So the obedience of *Superiours* is of the law of Nature, (and yet in the *primarie* law of *Nature,* there was no *Superioritie,* no *Magistracie;)* but this contribution of assistance of all to the *Soveraigne,* of all parts to the *Heart,* is from the very *first dictates of Nature;* which is,

[21] Attention was first drawn to these 'simmilitudes' by Sir George Paget in 1850, and they are quoted in D'Arcy Power's *William Harvey,* London, 1897, pp. 68-69. They are written out on ff. 117-118 of the MS and the complete version is given for the first time in: William Harvey: *De motu locali animalium 1627. Edited, translated and introduced by Gweneth Whitteridge.* Cambridge University Press, for the Royal College of Physicians, 1959, pp. 150-151.

[22] Harvey, William. *Movement of the heart and blood in animals . . . Translated by Kenneth J. Franklin.* Oxford, Blackwell, 1957, p. 108, para. 1.

in the first place, to have care of our owne *Preservation,* to look first to ourselves: for therefore doth the *Phisician* intermit the present care of *Braine,* or *Liver,* because there is no possibilitie that they may subsist, if the *Heart* perish . . . . And yet this is also another misery of this *King of man,* the *Heart,* which is also applyable to the *Kings* of this world, *great men,* that the venime and poyson of every pestilentiall disease directs itself to the Heart. . . .[23]

During the period immediately following the consultation Donne seems to have been obsessed with thought of the heart. In the expostulation accompanying the eleventh meditation from which the above quotation is taken the word 'heart' occurs 62 times in two and a half pages of text. In the twelfth meditation occurs the following passage: "The *Heart* in that *body* is the *King;* and the *Braine,* his *Councell;* and the whole *Magistracie,* that ties all together, is the *Sinewes,* which proceed from thence; and the *life* of all is *Honour,* and just *respect,* and due *reverence* . . . ."[24]

Here, surely, in a book published in 1624 and widely read at the time, and one moreover which would be of the greatest personal and professional interest to Harvey, is to be found the origin of his 'similitudes and analogies' written down in 1627 but not found in the earlier lecture notes on the heart and its function. It is no detraction from Harvey's genius to suggest that he was stimulated by a master of 'similitude and analogy.' It is yet another link between Donne and Harvey, and it may be that among Harvey's books which were lost in the great fire of London there was a copy of the *Devotions* presented by Donne.[25] We have to remember, with sorrow, how much has been lost that would make this kind of reconstruction unnecessary. If this echo of Donne can be found in Harvey's writings, Harvey's own lectures would account for much of the medical allusion in the later writings of Donne. The dissection and demonstration would have left an overwhelming impression on his sensitive poet's imagination so that he was haunted by the visual images and the echoes of the spoken words ever after.

We began with one puzzle, and we are forced to finish with another. Why then, is there no reference to the circulation itself? Of all things, if he had understood it, this would have seized upon Donne's mind, for to him God was the perfect circle. It was a figure

23 *Devotions,* Sparrow, Ed., pp. 61-62.

24 *Op. cit.,* p. 69.

25 I am of course aware that no book by Donne is listed in the catalogue of the College library published in 1660, three years after Harvey's death and five years before the Fire of London. This catalogue survives in a unique copy in the British Museum. Its introduction makes it clear that only certain categories of books are included—medicine and the sciences and books on the exploration of the remote regions of the world. Any books of literary or theological interest which Harvey possessed remain unknown.

he used again and again and even made the subject of a sermon. He was infatuated with it as he was with the concept of the microcosm and the macrocosm, and what splendid parallels he could have drawn between this internal revolution and that revolution of the spheres in their infinite spaces on which he pondered so much.

Aubrey tells us that he had heard Harvey say that "after his book of the Circulation of the Blood came out, he fell mightily in practice, and that 'twas beleeved by the vulgar that he was crackbrained, and all the physitians were against his opinion."[26] Presumably the reception of his ideas before the book came out could have been no different, but Donne was neither 'vulgar' nor 'physitian'; he was a man with one of the most alert and inquiring minds of his time, fired with the love of new knowledge and 'the sacred hunger of science.'[27] Even if Harvey's demonstrations had aroused antagonism and controversy among the physicians, it is extraordinary that no whisper of it should have been recorded somewhere in Donne's later writings. Would not Fox or Clement have delighted in arguing about it with their highly intelligent friend and patient who had published abroad his desire for enlightenment on this very subject? Would not Donne's predilection for the circle have made him a sympathetic recipient for such a solution?

We know that Harvey had been carrying out dissections and experiments for years before he gave his conclusions to the world either in 'ocular demonstrations' or in his book. He claims himself that the latter began in 1619 or earlier.[28] Many, who prefer to simplify the facts, state that Harvey demonstrated the circulation on April 16th or 17th in 1616, but we cannot be sure that the whole of the *Prelectiones anatomiae* were written in the same year and the much quoted statement on folio 80 may well be a later interpolation.[29] When Harvey at last began to speak of the circulation, the main facts were already settled in his own mind, but would it not take years of lecturing and writing before any of his auditors or readers could have as clear a picture as his own? We must not

26 Aubrey, John. *Brief Lives*, A. Clark Ed. Oxford, Clarendon Press, 1898. 2 vols. vol. i, p. 300.

27 It was this which led him to introduce the new ideas of Galileo, Kepler, and Tycho Brahe into such unlikely contexts. So numerous and substantial are his references that Coffin's study (n. 3) is an important contribution to the history of science in early 17th century England.

28 *Loc. cit.*, (n. 10).

29 This possibility has been discussed before, e.g. Archibald Malloch, *William Harvey* (New York, Hoeber, 1929, pp. 17-18), where the Keeper of Manuscripts at the British Museum is quoted as saying that "it does look as if written with different ink and probably another pen," so lending support to a suggestion first put forward by Underhill in 1905 that fo. 80 is a later interpolation.

underestimate the difficulties which beset genius when it first attempts to explain a completely novel idea to others still immured in a system of thought as closed as a prison with all exits barred. To us, with more than three centuries of scientific method behind us, nothing seems more beautifully clear and simple than Harvey's demonstration of the circulation. It could not possibly have seemed so to the president and fellows of the College of Physicians or to the most intelligent of the laymen who came into the lectures from time to time. Harvey's discovery must have seemed to them an odd eccentricity in a worthy fellow and an excellent friend, one to be listened to and politely humoured but not discussed. It is the customary English method of dealing with such embarrassments. The earliest reference to the circulation in any published work is in a book of Robert Fludd's[30]—and he was another eccentric!

30 *Medicina Catholica,* Frankfurt, William Fitzer, 1629. (See W. Pagel's Religious motives in medical biology. *Bull. Hist. Med.,* 1935, 3, 277.)

Niels Stensen's First Dissertation

GUSTAV SCHERZ*

NIELS Stensen, the famous 17th century scientist, is recognized today not only as a first-rate pioneer in anatomical discovery but as having laid down the fundamental tenets followed by modern experts in the sciences of paleontology, geology, and crystallography. Concerning his fundamentally reverent and bright approach to the works of nature and the mind we recall the words: "Beautiful is that which we see, more beautiful that which we know, but by far the most beautiful is that which we do not comprehend."[1]

Encouraged in the course of successful European research for the manuscripts and literary remains of the man known to his English contemporaries as Nicolaus Steno (1638-1686) I came to the U.S.A. in order to study Steno in relation to American history of science. In fact, there are not a few American scientists who deeply admired Steno. Sir William Osler (1849-1919), the Canadian physician and author who died as Regius Professor of Medicine at Oxford University, and whose library at McGill University in Montreal will record for all time his many contributions to the history of medicine, said of Steno: "No one should have a warmer place in our memory than the anatomist, geologist and theologian, whose name is on our lips in connexion with the duct of the parotid gland .... A strange figure, one of the strangest in our history ...."[2]

In the *Mendel Bulletin*[3] I came upon Harry Parker's enthusiastic account of him: "Nicolaus Steno was one of the most outstanding anatomists and physiologists of his day .... No paeon of ours can add to his greatness, for the voice of time has already sung his praise, no pen of ours can add to the glory which he has etched in the ageless annals of human accomplishments, even our words grow languid as we seek to learn and describe his nobility of soul ...."

* Copenhagen, Denmark.

1 The leading thought and comprehending word in Steno's *Proœmium demonstrationum anatomicarum in theatro Hafniensi*, 1673, when in his first great dissection as Anatomicus Regius he in a way also bade farewell to science. The Latin text is: Pulchra sunt, quae videntur, pulchriora, quae sciuntur, longe pulcherrima, quae ignorantur. (N. Stenonis, *Opera phil.*, II, 254)

2 *Canad. med. Ass. J.*, 1913, 2, 67-68.

3 School of Science, Villanova College, 1935, pp. 13-18.

I never dreamt, however, that in the first week of my visit to the United States I would come across Niels Stensen's first printed publication, never mentioned by the author himself and completely forgotten by historians of science for three hundred years. The discovery took place on 16 April 1959 in the Library Company of Philadelphia which contains a wonderful collection of early books known as the Loganian Library. It was among these books that with the assistance of the librarian I came across Steno's short treatise *De thermis* (On thermal baths), which was the subject of a lecture he delivered on 8 July 1660. It is surely one of the finest contributions to the tercentenary this year of Steno's first scientific discovery in April 1660.[4]

At that time Niels Stensen, the son of a goldsmith named Sten Pedersen, had already left Denmark, where he had done his undergraduate studies at the University of Copenhagen, enjoying the guidance and friendship of such outstanding professors as Simon Paulli, the botanist, Ole Borch, the chemist, and Thomas Bartholin, the anatomist and well-known author of textbooks and learned letters. Steno probably left Copenhagen at the end of 1659, and after spending some time in Rostock, went through Germany to Holland, Denmark's ally, arriving in Amsterdam about 20 March 1660. It was Holland's golden century in political and financial power as well as in art, science, and literature. Walking past the rich buildings bordering the canals of Heerengracht, Kaizersgracht, and Singel, listening to a beautiful carillon from the Town Hall and visiting Amsterdam's social and health institutions, such as the Rasphuys, a workhouse for men, the women's Spinhuis, the Weeshuis for poor girls and boys, and the Dol Huis for lunatics, the young student certainly must have been deeply impressed by Dutch culture. Of special interest to the Danish anatomist must have been the "Gasthuys," a large campus of buildings, courtyards, and gardens with departments for men and women, for soldiers and sailors, for wounded people, strangers, and the poor, and the anatomy theatre in one of the halls of the meat market.[5]

4 I made known my discovery when I delivered my lecture on Steno at Yale University on 21 April 1959 at the invitation of Prof. Dr. John F. Fulton, to whose great contributions to the history of science I wished to pay homage by this disclosure. For valuable hints in this treatise I owe my sincere thanks to Dr. I. H. van Eeghen of Amsterdam and Dr. A. Garboe of Copenhagen.

5 Steno's life and work are made accessible to our time by three great editions of his writings: *Opera philosophica*, V. Maar, Ed., 2 vols., Copenhagen, 1910 (the natural scientific achievement with a commentary and bibliography); *Opera theologica*, K. Larsen and G. Scherz, Eds., 2 vols., Hafniae, 1941-1947 (the apologetical, pastoral and ascetical writings, with German introduction and commentary); *Epistolae et epistolae ad eum datae*, G. Scherz, Ed., 2 vols., Hafniae-Friburgi, 1952 (the correspondence, with 130 pages of

Thomas Bartholin had recommended Steno to Gerard Blasius, who urged the student to stay at his house on the Verwers Gracht, which must have been a kind of boarding house or small college, since Steno mentions a little study.[6] Gerard Blaes (latinized Blasius, *c.* 1625-1682), whose father had been an architect under the Danish King Christian IV, had in 1660 just been appointed physician of the town and from September 4th *professor extraordinarius* at the University of Amsterdam, the Athenaeum, located in the former convent Church of St. Agnes on the Burgwal.[7]

It was in his boarding house that Niels Stensen on 7 April 1660, a few weeks after his arrival at Easter, made his first discovery of what is now known as the *ductus Stenonianus,* the parotid salivary duct, leading from the ear's salivary gland to the mouth. Steno's own vivid description addressed to Thomas Bartholin is worth remembering:

> It is a year now since I was hospitably received by Blaes. Following his lectures and after awaiting three weeks for a chance to secure anatomical material, I asked the distinguished man whether I might be permitted to dissect with my own hand such material as I could buy for myself. He gave his consent and fortune so favored me that in the first sheep's head, which I bought on April 7th and was dissecting alone in the study, I found a duct which, so far as I knew, had been described by no one before. I had removed the skin and was preparing to dissect the brain when I decided to examine first the vessels which surround the cavity of the mouth. With this end in view I was exploring the courses of the veins and arteries when I noticed that the point of my knife was no longer closely confined between the tissues, but moved freely in a large cavity, and presently I heard the teeth themselves resound as I thrust my knife forward.

historical-biographical introduction and commentary (German), an extensive list of literature and 100 pages of contemporary documents).

Books on Steno: As to old, rare books, see Steno's *Epistolae,* register. *Biographies in our century:* A. D. Jørgensen: *Nils Stensen,* 2d. ed. by G. Scherz, Copenhagen, 1959; W. Plenkers: *Der Däne Niels Stensen,* Freiburg in Br., 1884; K. Plovgaard: *Niels Stensen, anatom, geolog, biskop,* Copenhagen, 1953; M. Bierbaum: *Niels Stensen. Von der Anatomie zur Theologie.* Münster in Westf., 1958; G. Scherz: *Vom Wege Niels Stensens,* Copenhagen, 1956; G. Scherz: *Nicolaus Steno and his Indice,* Copenhagen, 1958;

On Steno's posthumous fame: G. Scherz, *Im Rufe der Heiligkeit,* Freiburg-Copenhagen, 1953. Since 1953, *Stenoniana Catholica,* three numbers a year, are published from Copenhagen with new contributions to Steno's life, also in order to forward his canonization.

[6] C. van der Vijver, *Geschiedkundige Beschrijving der Stad Amsterdam,* Amsterdam, 1844-1848. See also J. Wagenaar's history of Amsterdam. One of Steno's pupils has left in his diary a description of the impressions that young Danish travellers got in Holland: *Holger Jacobaeus' Rejsebog* (1671-1692), V. Maar, Ed., Copenhagen, 1910.

[7] See Steno, *Opera phil.,* I, 62, 147. From 1639 the "Theatrum Anatomicum" of Amsterdam was in the "Vleeschhal." Blasius probably dissected both in the Vleeschhal and in the hospital of the town (*Gedenkboek van het Athenaeum . . . ,* 1932, p. 409). Of the earliest history of the Athenaeum, I. H. van Eeghen (*De eeerste jaren van het Athenaeum.* In: MDCCCII Het Illustere Begin van het Athenaeum. Amsterdam, 1957) says that an "Egyptian darkness" was brooding over it. The academic life was rather restricted, without any examination or promotion.

> In amazement at the discovery I called in my host [Blaes], that I might hear his opinion. First he ascribed the sound to the violence of my thrust, then resorted to calling it a freak of nature and finally referred to Wharton.[8]

Blasius, who at first failed to understand the significance of the discovery, later claimed it as his own.[9] He did so in his book: *Medicina generalis nova accurataque methodo fundamenta exhibens* (Amsterdam, 1661). At that time Steno was already in Leiden and his professors Fr. Sylvius and J. van Horne had publicly acknowledged his discovery.[10] A controversy with Blasius broke out, which was finally settled in favor of Stensen who made a thorough exploration of the entire glandular system to prove his claim to the discovery. It took him two years, but the result was to make him the leading expert in this subject and later in the structure of muscles.[11]

Apart from this discovery of the parotid duct nothing had hitherto been known of Steno's first three months in Amsterdam until he matriculated at the University of Leiden on 27 July 1660, before I was privileged to find his first printed dissertation in a library in Philadelphia. It is a disputation on the nature of hot springs or baths which in 19 paragraphs makes statements about the origin and contents of these natural, heated waters. In two corollaries, defending his views, the youthful expert answers two important questions suggested by the scientific interests of the chemistry of his day.

From these few remarks it may be seen that the outward form of the dissertation was that of the medieval scholastic discussion of learned subjects according to a rigid set of rules for attack and defence. Every professor of the 17th century had to dispute with his pupils in this way several times a year, offering them the opportunity of personal selection of problems, very necessary at a time

[8] *Epistolae*, I, 3. *Opera phil.*, I, 4. Steno once more described this discovery: *Ibid.*, I, 23.

[9] Blasius' character is shown in a gloomy light by his invective against his pupil: "He dismisses his victim, who was only twenty-three years of age at the time, as a 'wretched boy,' and accuses him of deceit, ingratitude, bad manners, injustice, blundering, foolishness, perfidy, incivility, untruth, treachery, calumny, scoffing, malice, arrogance, perversity, audacity, shamelessness, impudence, fatuity and depravity . . . The judgment of posterity, however, leaves the issue in no doubt, and the invective of Blasius is condemned as the measure of his own mendacity in laying claim to this modest discovery." (F. J. Cole, *A history of comparative anatomy*, London, 1944, pp. 151 f.)

[10] Steno, who called his discovery a little one, in his first controversy already followed the principle to which he adhered at the end of his scientific period: "Cognitio veritatis omnia falsa, si modo proferantur, etiam quae prius inaudita erant, et dijudicare et subvertere idonea est." (*Opera. phil.*, II, 256).

[11] Steno made known his discoveries on the glands in his *Observationes anatomicae* (Lugd. Bat., 1662), and on the glands and muscles in his "golden booklet," *De musculis et glandulis observationum specimen* (Hafniae, 1664).

when instruction usually meant dictation. It was the professor who had to be the president at such disputations after having chosen the thesis, whereas one of the students was the defendant or respondent, and the others were the opponents. Those theses, at first being short statements, soon developed into small treatises, often ending with some corollaria in which special problems were stressed.[12]

Steno's dissertation was not presided over by Gerard Blaes since he did not become *professor extraordinarius* until 4 September 1660 and was not yet allowed to preside at such academic exercises. Moreover, Blasius, an eager writer and compiler, was probably a poor and unpopular teacher.[13] It was the *professor primarius* of philosophy, Senguerd, at that time also prefect of the University library and curator of the public schools, who acted as president.

Arnold Senguerd or Senckward (1610-1667), born in Amsterdam, had since 1639 been professor of metaphysics and physics, and since 1641, *professor primarius* of philosophy in Utrecht, where Steno later on gained many friends. In 1648 Senguerd moved to the Athenaeum of Amsterdam and there he became gradually more interested in subjects of natural philosophy and science. This interest probably also arose through the demand of students to be allowed to dispute under Senguerd, for instance, problems of oste-

12 W. Norvin, *Köbenhavns Universitet* (Kobenhavn, 1937), I, 243 ff. Of such disputations not held "pro gradu," but "exercitii causa," L.-D. Petit says that they probably were printed in a small edition and at the expense of the academy. The defendants or respondents dedicated them to their professors and protectors and distributed them to their family and friends. They were a proof of their progress and a testimony of the satisfaction of their professors who allowed them to put their name as a defendant beside the president's name. Probably the dissertations were not for sale, which explains their rarity. But their value was high in the 17th century. (Una saepe pagella plus succi et bonae frugis habet quam spissum chartarum volumen. J. H. Hottinger, *Bibliothecarius quadripartitus*, Tiguri, 1664). Paul Dibon, *La philosophie Neerlandaise*, Amsterdam, Elsevier Publishing Company, 1954, p. 38. The author speaks of dissertations at Leiden. As to authorship of such dissertations held "exercitii causa" it must be remembered that they generally were a continuation of the professor's lectures, most of them being parts of a series chosen by the professor Edwald Horn after studying thousands of them (*Die Disputationen und Promotionen an den deutschen Universitäten, vornehmlich seit dem 16. Jahrhundert*, Leipzig, 1893) says that the president was usualiy also the author of the thesis, or the subject was taken from his lectures. In any event the professor revised the material before delivering it to the dean (Dibon, p. 43). Yet as the aim of dissertation also was the independent treatment of matters by the student, the latter probably also must have had some influence on their form.

13 Steno in his *Apologiae prodromus* reproached Blasius because he had not learned anything worth mentioning in Amsterdam ("dum sub illo praeter vulgares et nudas operationes Chymicas nihil discerem") and so lost time better spent in Leiden (*Opera phil.*, I, 147). Posterity gets the impression of a pupil forming and influencing his teacher, as Blasius later on became a good comparative anatomist, who by his editions of 1673, 1674 and 1681, and by his founding of the shortlived "Private College of Amsterdam" made valuable contributions to the history of comparative anatomy. Steno's ideas, represented in this circle by his friend Jan Swammerdam, were at that time duly acknowledged (F. J. Cole, *loc. cit.*, pp. 330 ff.)

ology. This professor is said to have been a man of *candor* and *humanitas,* of *doctrina* and *industria.* His moderate mind also influenced his scientific methodical research.[14]

A short summary of the contents of Steno's dissertation shows the brevity and clarity that we have learned to appreciate in his later writings. First the word "thermal" springs is derived from the Greek *thermos,* warm, as the springs actually have the power to warm or have originally been warm. Sometimes thermal waters mean only those able to induce a sweat. They are also called metallic waters, as most of them contain metallic substance. The origin of the heat in those springs is an obscure problem, Steno states, but there must be an origin, as water by its nature is cold. Sections V-IX discuss the possible exterior causes of thermal heat: motion through rocky districts, burning sulphur, subterranean fire, slaked lime. X. Maybe all of them contribute to the heat, a problem to be left to the viva voce discussion. XI. The mineral particles in hot springs certainly come from the surrounding places through which they run. XII. There are gaseous, humid, and solid bodies and each of those classes may contribute to the mineral substance in hot springs. XIII. As to the gaseous contributions, these are evident from their smell. XIV. That minerals are extant may be shown from the taste. XV. The existence of solid substance may be proved by the ochre in canals or the stony substance sometimes found in canals through which water is flowing. XVI. As to the gaseous spirits (spiritus) they may come from the minerals themselves or their surroundings. XVII. The clearness of thermal water in spite of their solid components is explained by the fine and thin particles mixed with water. XVIII. The difficulty of such firm substances as metal being disintegrated in water seems to be solved by relating some experiences in nature. XIX. Thermal waters may contain substances of both perfect and imperfect metals.

[14] Senguerd published several philosophical treatises such as *Collegium metaphysicum* (Traj. 1635 and 1640), but then especially in Amsterdam became interested in natural science publishing *Exercitationes physicae* (1659) and *Osteologia corporis humani et discursus de ostento Dolano* (Amsterdam, 1662). See A. J. van der Aa, *Biographisch Woordenboek der Nederlanden,* vol. 17 (Haarlem, 1874), pp. 613 f. *Illustris Amstelodamensium Athenaei memorabilia.* D. J. van Lennep, ed., Amstelodami, 1832, pp. 119 ff.) *Gedenkboek van het Athenaeum en de Universiteit van Amsterdam 1632-1932* (Amsterdam, 1932). The funeral orator said of Senguerd: "Aristotelem cum veteribus secuti, sed qui diligentissime etiam recentiorum placita perpenderet, quae veritati congrua viderentur probaret, facile quoque dissentientes ferret" (*Illustris Amstelod. Athenaenaei Memorabilia,* p. 120). In his "Oratio inauguralis De vero philosopho" Senguerd wants the philosopher to cultivate such virtues as piety leading to God's worship, humble mildness securing a judgment free from passion, virtues for which Steno too was striving. See Dibon, *La philosophie Neerlandaise,* p. 241 ff.

Fig. 1. Niels Stensen, Bishop, by Chr. Aug. Lorentzen. Medicinsk-anatomisk Institut, Copenhagen.

FIG. 2. The Athenaeum of Amsterdam.

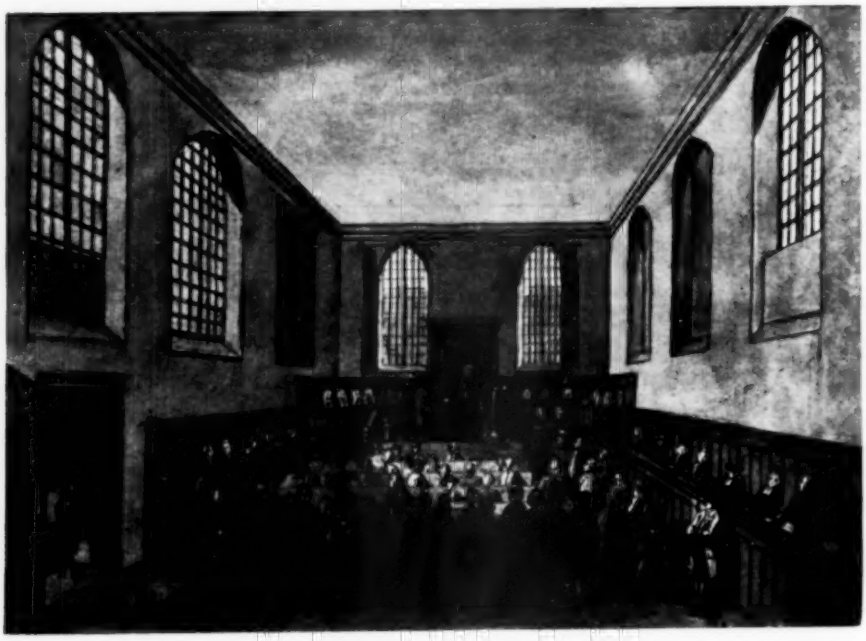

FIG. 3. A lecture at the Athenaeum.

The two final corollaries propose the questions: 1. Are the gold particles of a nature different from water? Yes. 2. Do iron and chalybs differ as to their species? No.

As mentioned above, the topic of the dissertation probably was chosen by Professor Senguerd; this idea is borne out by the complete volume of disputations, of which Steno's is only one. This volume has the printed general title: *Arnoldi Senguerdi Philosophiae Doctoris ac Professoris Primarij:* ATHENAEUM AMSTELODAMENSE. *Plusquam Nonaginta Disputationibus celeberrimum.*[15] From the handwritten index of those 93 disputations, giving the titles and respondents (and well worth publication in full), it is evident that Steno's disputation and its topic were related to the others preceding or following, which concern metals, minerals, and stones.[16]

How did this rare copy of a disputation come to Philadelphia? The founder of the Loganian Library, James Logan (1674-1751), the colonial statesman and scholar, was of Scottish ancestry on both sides, his father Patrick Logan of East Lothian being a Master of Arts of the University of Edinburgh and a clergyman in the Established Church until his conversion to Quakerism in 1671, while his eldest son William became a distinguished physician. In September 1699 James sailed on the *Canterbury* with William Penn to Pennsylvania. Apart from his official duties he made a fortune in land investment and in trade with the Indians.[17]

James Logan corresponded with many eminent men of his time and he also was a voracious and critical reader who collected over three thousand books which represent one of the most valuable libraries of scientific literature in the 17th century. It not only contained excellent English scientific books,[18] but also books of most of the significant contemporary European writers of his time, from Thomas Bartholinus and Ole Borch in Denmark to Carlo Dati, Francesco Redi and Marcello Malpighi in Italy.[19] James

[15] The collection was probably gathered together in one volume by the bookseller who first had printed all the dissertations separately and had kept the type. The individual theses were distributed among the auditors before the disputation.

[16] In the "Disputationum ordo Eorumque nomina, qui reponderunt in hoc Athenaeo Amstelodamensi" Steno's dissertation is No. 35. No. 32 De anima rationali. Resp. Jacobus Clercq. No. 33 De remorâ prima. Resp. Wolferdus Senguerdius. No. 34 De remorâ altera. Resp. Thomas Bolwerck. No. 36. De metallis. Resp. Henricus. Uurlingius. No. 37. De mineralibus prior. Resp. Isaacus Kip. Posterior eodem. Then come seven dissertations De lapidibus. Resp. Wilhelm Arnoldus Senguerdius.

[17] *Dictionary of American biography*. New York, 1933, vol. XI, pp. 360-362.

[18] "He is credited with importing the first copy of Sir Isaac Newton's *Principia mathematica* into the Colony, and although largely self-taught in mathematics, he was able to comprehend it." Brooke Hindle, *The pursuit of science in Revolutionary America 1735-1789*, Chapel Hill, 1956, p. 21.

[19] *Catalogue of the books belonging to The Loganian Library*, Philadelphia, 1837.

Logan was even a rather important scientist himself. He suggested various alterations in the theory of the moon's motions and published a treatise on optics in which he suggested improvements in some of Huygens' methods of treating lenses. His greatest contribution to science was in botany, on the sexuality of plants, when he demonstrated by carefully controlled experiments the function of pollen in fertilizing maize. Linnaeus named a genus for him.[20]

Having collected his great library at considerable expense, James Logan was anxious to make it useful for posterity. To that end he erected a suitable building in Philadelphia for the reception of his collection, but only after his death did his children carry into effect his intentions, conveying the building and books to trustees who had the library arranged. It then consisted of more than two thousand volumes; but about 1,300 volumes, collected by Dr. William Logan of Bristol, the physician and younger brother of James, and by William Logan, his son, were later bequeathed to the institution by the younger William who acted for some time as librarian.[21]

However, the Senguerd volume containing Steno's dissertation did not belong to the Loganian Library before 1837 when the General Catalogue was printed; it is not found registered until 1867, when the First Supplement to the Catalogue was published.[22] There it is mentioned as a gift of Albanus C. Logan, Esq., a son of George Logan, M.D., and a grandson of William Logan, the brother of James. We are even able to trace the volume back to the original owner by a note on the handwritten title leaf: "Sum Ex libr. Henrici Solijns. Eccl.ᵉ neo-Eboracensis." This inscription was certainly written by the Dutch Reformed clergyman Henricus Selijns (1636-1701) who came from a good Amsterdam family. He is called "the most cultured of all the Dutch preachers who came to New-Netherland in the seventeenth century." After a thorough training for the ministry at the Athenaeum of Amsterdam and after passing his examinations at the University of Leiden, he was chosen by the "Deputati ad Res Indicas" of the Amsterdam Classis for the ministry in America. Ordained on 16 February 1660 and having received his appointment on 26 March, he crossed the Atlantic on "De Vergulde Bever" with another preacher, Hermannus Blom destined for Esopus, and reached New Amsterdam on 11 June

20 Hindle, *loc. cit.*, 21 ff. "Logan was undoubtedly the most distinguished in the area," p. 68.

21 The Loganian Library, p.Vf.

22 *The first supplement to the catalogue of books belonging to The Loganian Library*, Philadelphia, 1867, p. 25.

1660. After four years' service at Brooklyn, where his congregation numbered 134 persons, he returned to Holland and accepted a call to Saverveen in the province of Utrecht. Twice he refused a call to New York, but he accepted the third one and in 1682 sailed for the second time to America. He was a tolerant man in ecclesiastical matters and a popular preacher and left a deep impression by the faithfulness of his ministry and the piety of his life.[23]

Selijns' interest in the volume of the *Athenaeum Amstelodamense* is understandable, because he is respondent in one of the dissertations. No. 46, entitled "Problematica," bears the name of Henr. Selijns, who certainly was the owner of the whole volume. As a minister coming to the young American colonies, he carried with him the volume, which the Logan family finally acquired, probably after his death in the first year of the new century.

It is worth mentioning that Steno's first dissertation is on a mineralogical-geological topic, not an anatomical one. Had he had any opportunity to make observations on hot springs and thus discuss his own experience? While at the end of the Middle Ages fountains and hot springs were in general use, the great development of baths began in the 17th century, when the mineral waters were used not only externally but were also taken internally. Many health resorts flourished all over Europe, and not even the 30 Years' War could prevent patients, at a time when the practice of medicine was rather primitive, from looking for the natural help available in fountains.[24]

Denmark also had her sanitary fountains. Two of them, near Copenhagen, Vartov Kilde and Kirsten Pils Kilde, are rather well known in history and literature. By far the most renowned was the fountain Helene Kilde near Tisvilde, venerated in pagan times, held sacred in Denmark's Catholic centuries, and attended by king and people even in the Lutheran period, so that the Lutheran bishop in Steno's childhood, Jesper Brochmand, in 1639 felt obliged to take measures against it. Christian IV in 1645 sent samples of the fountain water to seven outstanding physicians (among them being Steno's old friend Simon Paulli) for a trial, and one of the responses was published by Thomas Bartholin in his *Historiae anatomicae*.[25] Another of Steno's teachers, Ole Borch, liked to send his patients to this water, and Casper Bartholin had

[23] *Dictionary of American Biography*. Ed. by Dumas Malone. London, XVI (1935), pp. 572 f. *Nieuw Nederl. Biogr. Woordenboek*, 1914. 3. 1160-1166).

[24] Matts Bergmark, *Bad och bot.*, Stockholm, 1959, pp. 92 ff.

[25] Chr. Blinkenberg, Helene Kilde i de skiftende Tiders Lys. In: *Vor Fortid*, No. 4. 2. Aarg. Copenhagen.

already in 1618 written a little book, *De aquis libri II,* chapter VIII of which had the title: 'De thermis earumque causis.'

Steno might also have seen hot springs when travelling through Germany. Aachen's famous sulphur springs had been known since Roman times and its limpid (about 55°) warm waters containing several chemical substances attracted thousands of visitors and guests. Pyrmont and the surrounding district also had many medicinal fountains, of not more than 12° but very efficacious in various sicknesses.[26] Yet as far as one can see, the treatise *De thermis* was not prepared as a result of personal research. In this scholastic dissertation the Stenonian mind is revealed only by such qualities as brevity, limitation to the principal problems, and a sober common sense in avoiding explanations obviously fantastic at a time when the fundamental principles of chemistry, geology, and mineralogy were still unknown. What a difference, for example, between this treatise and Athanasius Kircher's extensive *Mundus subterraneus* which was published only four years later in Amsterdam. Of Kircher's fanciful description of the globe and its waters, V. Maar writes: "In this work, which is a folio volume of many hundred pages, speculation is so interwoven throughout that even the correct observations to be found there become completely worthless."[27]

What a difference also between the Steno of 1660 and of 1669, after he has stated his fundamental ideas on the history of the earth and has become acquainted with the subject of thermal waters! In Italy in the course of his geological research he had good occasion to observe thermal springs and their effects. In his *Indice,* the catalogue of his mineralogical-paleontological collection, he observes the yellowish incrustation on some rock crystals or a curious incrustation of chalcedony, the incrustations on shells and on several forms of coral.[28] He had seen the incrustations of various colours made by water near Tivoli in the limestone ridge west of Rome, the effects of fire in the volcano Etna, the greatest eruption of which in 1669 was described and discussed in the circles of the Accademia del Cimento of Florence. Steno came on the phenomena of Italian solfataras, the volcanic openings which send out vapours rich mainly in sulphur compounds, especially the solfatara of the Phlegraean rocks northwest of Pozzuoli, known for its grey-

26 Ad. Joanne et a. Le Fileur, *Les bains d'Europe,* Paris, 1880, pp. 1 ff; 104 ff.

27 Nicolaus Steno, *Faste Legemer der findes naturlig indlejrede i andre faste Legemer.* A. Krogh and V. Maar, Eds., Copenhagen, 1902, p. II.

28 Scherz, *N. Steno and his indice,* pp. 237, 253.

white boiling masses with silicates, kaolin, and alum. In Italy Steno visited the Lagoni of Volterra, regions without vegetation and with hollows full of warm, steaming water smelling of sulphur, and Libiano, known for its sulphur pits. Then during his long journey of 1669-1670 the traveller had ample occasion to see Karlsbad and its 17 hot springs and how the salt contents with other important substances formed a brown-coloured aragonite sinter. Steno's *Indice* also mentions the incrustations he found in the silver mines of Bohemia, of the Tyrol, of Hungary, "and other places."[29]

How important a treatise about hot springs Steno might have written after these years of geological and mineralogical research we may guess from the few lines on fountains in his *Prodromus,* which now may be seen in a new light against the background of his first scientific meeting with thermal problems. In this *Prodromus* he has a chapter about "The passages of things flowing out of the earth," the third section of which surely represents a great number of observations and experiments he had made in his Italian geological research:

> *Fetid Exhalations,* and hot or cold *Ebullitions,* &c. Nor is there any doubt left, *that* Cold and Dry places, as often as Water is poured on them, do buble up without any sign of Heat; *that* at the sides of a very Cold Fountain there breaks out an Hot Spring; *that* by an Earth-quake an hot Spring may be changed into a cold one, and Rivers alter their course; *that* Valleys closed round about may cast the Rain-Waters into lower places; *that* Rivers fallen under ground may elsewhere come forth again; *that* in laying foundations Builders do often labour altogether in vain, meeting with Quick-sands, as they call them; *that* in some places, where Pits are digg'd, are first found Waters near the surface of the Earth, then, after the Earth has been digged up to the depth of many feet, new Waters are met with, springing upwards, upon vent given, beyond the height of the first waters; *that* whole Fields with their Trees and Houses do by degrees subside, or are swallow'd unawares, so that there come to be vast Lakes, where formerly stood Towns; *that* those who live on Plains are in *danger* of such ruines, if they be not sure of a stony foundation under them; *that* at times there are open'd Gulfs exhaling a pestiferous Air, which by store of Bodies thrown in are again stopp'd up.[30]

The finding of *De thermis* in America is not without significance in connection with the problem of the influence Steno's work had on the development of geological science. In the 18th century

[29] Scherz, *loc. cit.*, pp. 272 ff. Italy is one of the richest countries with regard to thermal and mineral waters. See M. Messini and G. Di Lollo, Acque minerali del mondo, Rome, 1957, pp. 145 ff.

[30] N. Stenonis *Opera phil.*, II, 202. Our translation is from: *The prodromus to a dissertation concerning solids naturally contained within solids.* By Nicolaus Steno. English ed by H. O. London, 1671, pp. 49 ff. See also: J. G. Winter, *The prodromus of Nicolaus Steno's dissertation,* New York, 1916, p. 235.

he seemed quite forgotten and not until the 19th century was his importance gradually recognized. V. Maar has pointed to the fact that the most important contributions to geology in the 18th century came from Italy and England where Steno was best known, and he finds it quite probable that Steno's work in particular has influenced the development of English science.[31] Investigations in recent years have, moreover, revealed how highly esteemed and appreciated Steno's geological work was among the English naturalists. His discoveries were soon well known in Britain and eagerly discussed in the sessions of the recently founded Royal Society. Only two years after its first appearance Steno's *Prodromus* was translated into English by H. Oldenburg, the Society's secretary.[32]

It is from these pioneers of English science that a line may be traced to the first examples of American research. Its first impact has been rather difficult to trace and is usually put in the middle of the 18th century. Brooke Hindle in his book on the history of science in the United States up to 1789 quotes Benjamin Franklin's rather optimistic words of 1743: "The first drudgery of settling new colonies which confines the attention of people to mere necessaries is now pretty well over; and there are many in every province in circumstances that set them at ease, and afford leisure to cultivate the finer arts and improve the common stock of knowledge."[33] Yet soon after follows another, more realistic, statement in 1745 by the American botanist John Bartram critically ranking the inhabitants of the new land into three classes, the first one occupied with laying up large estates, the second one living in luxury, the third one by necessity forced to hard labour, yet often the most curious.[34]

Now the discovery of Steno's *De thermis* in James Logan's library draws attention to the fact that one of the most significant American scientists and his family at the end of the 17th and in the beginning of the 18th century knew and appreciated Niels Stensen and his work. This is the more apparent as Logan's library also contained other Stenonian works: his little book about the glands (1662), his *Specimen* on the muscles and glands (1664), and his

31 N. Steno, *Faste Legemer*, Krogh og Maar, Ed., pp. X ff.

32 See V. A. Eyles, Nicolaus Steno, seventeenth-century anatomist, geologist and ecclesiastic, *Nature*, 1954, *174*, 8-10. V. A. Eyles, The influence of Nicolaus Steno on the development of geological science in Britain, in: Scherz, *N. Steno and his indice*, 167-188. R. Rome, Nicolaus Stenon et la Royal Society of London, *Osiris*, 1956, *12*, 244-268.

33 Hindle, *op. cit.*, p. 1.

34 *Ibid.*, pp. 5 f.

Discours sur l'anatomie du cerveau (1669), writings which Logan may have carried with him from his homeland.[35] That Steno's myology and his principal geological treatise *De solido* are not mentioned in the Loganian Library given to the public does not mean that the family did not possess them since other valuable books were not delivered to the family's public foundation until later, as in the case of the *Athenaeum Amstelodamense,* which was not finally donated until the 19th century. Moreover, other citizens of New America shared Logan's interest in Steno, at least his fellow student, Solijns, who had even known Steno from his very first stay abroad at the Athenaeum of Amsterdam in 1660 and then had brought *De thermis* to New York. The first representatives of scientific America thus had certainly at a very early period the possibility of studying Steno and getting acquainted with his fundamentally new ideas.

[35] This signature, "J. Logan," may be seen on the title-pages of the booklets.

DISPUTATION IN PHYSICS CONCERNING THERMAL WATERS

Which with the very distinguished and learned ARNOLD SENGUERD, Master of Liberal Arts and in the illustrious University at Amsterdam a *professor primarius* of Philosophy presiding, is to be publicly defended by NIELS STENSEN, a Dane from Hafnia on the 8th July at the usual time and place. At Amsterdam with Johannes van Ravesteyn[1] the Printer of the city and the illustrious school. MDCLX

To the very distinguished and learned ARNOLD SENGUERD Doctor of Philosophy and a *professor primarius* of the same in the illustrious lyceum of Amsterdam, who is likewise Prefect of the library, and the most worthy Curator of the Public Schools. And also to the very celebrated and highly experienced man, D. BLASIUS GERARD LEONARDI a Doctor of Medicine, and a very successful practitioner in the flourishing republic of Amsterdam, professing medicine there publicly, to that President, to this host and to both his Instructors, he submits himself NIELS STENSEN

DISPUTATION IN PHYSICS CONCERNING THERMAE[2]

I. The word "thermae" is derived from the word 'thero,' I make warm, whence we have the word 'thermos' warm; therefore waters which we are now considering are called thermal because all or at least the majority of them have the power to warm. And those which are actually cold in the upper surface of the earth are believed by Falloppio[3] to be warm at their

[1] Johannes van Ravensteyn (1618-1675), belonging to a family of booksellers, was a private printer and bookseller who had the monopoly to print for the town and the Athenaeum (M. M. Kleerkooper en W. P. van Stockum jr., De Boekhandel te Amsterdam voornamelijk in de 17e eeuw I-II. S. Gravenhage 1914-16. p. 578 ss).

[2] For valuable help with the translation to English I wish to give my sincere thanks to Rev. George Kathrein C.SS.R., Oakland and Dr. V. A. Eyles, Oxford.

[3] Gabriele Falloppio (1523-1563), the great Italian anatomist of Padova and one of the greatest surgeons of the century, also wrote a significant book *De thermalibus aquis libri septem. De metallis et fossilibus libri duo,* Venezia, 1564 (G. Falloppii *Opera Omnia,* Francoforti, 1600, pp. 193-268). The last of the 32 chapters describe the Italian hot springs. The passage Steno refers to says (p. 196): "Nec sine mehercule ratione, ab eo quod calefaciant, et thermae, et thermales aquae sunt vocatae; quoniam omnes fere aquae istae calidae sunt, aliae tamen magis, aliae minus, ut aliae sunt subtepidae, aliae ferventissimae: dixi autem fere omnes, quoniam reperiuntur nonnullae (sed rarissimae) quae non sunt calidae, imo frigidissimae sunt. Verum licet quae frigidae actu sunt, in terrae superficie sint tales, tamen credo quod in suo principio, hoc est in locis subterraneis remotis à terrae superficie, id est in canalibus ipsis, calidae et ipsae sint; et quae me movet ratio est, quia video Aquarianam quam quae frigida actu, ut nostis est, servari incorruptam per spatium centum et plurium annorum." See also P. Capparoni, *Profili bio-bibliografici di medici e naturalisti celebri Italiani* (Roma, 1928) 2, 46 ff.

origin or in the lower subterranean regions; for these remain unchanged for a long time, namely, for many years, although they are removed from their original source; this he thinks would not be possible if the waters were not very well mixed; and because the mixture arises from heat that is digesting and boiling, he thinks that heat is to be attributed also to those waters.

II. The places where such waters are contained are called baths, and the waters themselves are known as bath waters; however, some distinguish between 'thermae' and 'baths' because 'thermae' are properly waters that we go into for the sake of sweating and are called 'sweat-baths'; but those that we go into for the sake of washing are properly called 'baths'; but this dispute we leave to the philologists.

III. They are also known as metallic waters, because many of them, if not all of them, contain some metallic matter; because of their efficacy || and use in the medical field they are called medicinal waters.

IV. Whence the 'thermae' derive their heat is a matter that is still very uncertain. Water by its nature is cold, which is evident from the fact that when it is left to itself, and when the warming cause is removed, even though it may have been extremely hot, it becomes cold again. That this cold is not imparted to it by the air is evident from the fact that the water becomes colder than the air, but the air is not able to impart a greater intensity of cold than it has itself. It is necessary, therefore, to seek an external cause of this heat.

V. May we say that the cause of this heat is the friction of the water and its frequent cutting into rocky places? This thought does not lack all probability, because bodies grow warm by motion and if it turns out otherwise, this is due to accidental circumstances; now the places where the springs of such waters exist are usually rocky places.

VI. An objection seems to rise against this opinion, because if that were the true cause of the heat of the 'thermae' then also springs of water, which at present flow cold, ought to be hot, for they are also beaten and agitated and subject to friction as they go through the stones and the rocky mountains. This difficulty has not such great weight, because the various mountains consist of rocks of different nature, shape and position in relation to each other, so that the diversity of the pores which results from this, and the various sharp points of the stones could be the cause so that from these rocky and craggy mountains hot water could flow; but from others on account of the large size of the pores and the rarity of sharp edges, the water is not divided in the same manner, and it comes out cold. ||

VII. There is another question; namely, whether the heat arises from the sulphur. The objection to this is that sulphur is extinguished in water, and as long as it is not in a burning state, it may not bring forth heat; hence

it seems that it may have the aspect of a material cause but not of an efficient cause[4] (of the heat); the same may be said of pitch.

VIII. But can it be said that subterranean fires that are dispersed in the bosom of the earth, cause this fire? It is sufficiently clear that there are subterranean fires from the existence of mountains that send forth fire. The objection to this opinion seems to be that every fire needs supply, and there can hardly exist any cause which could feed those subterranean fires, since pitch, sulphur and whatever else there are of such kind are consumed by burning.

IX. [It may also be asked], does lime and do ashes heat those waters in the bosom of the earth? We see that fire, heat, and the boiling of water arise when water is poured on live lime. And here there is the difficulty: namely; whence such a great amount of lime could come; besides, from this there can hardly be derived a reason for the continued existence of the heat.

X. It does not seem to be contrary to reason to assert that these diverse causes unite in the heating of the thermal waters. It is indeed certain that heat arises from the motion of bodies. There is less reason to deny that from the wearing away of the sulphur and from the agitation of the sulphur that has been worn away, heat is generated, since heat which is potentially in the sulphur is brought into actuality. That there is sulphur in thermal waters || is very clearly evident not only because this is ascertained from the smell and the taste, but also from the abundance of sulphur which is found in thermal cisterns and canals. That there are subterranean fires cannot be doubted because of the testimony of experience. It is likewise certain that water that is stirred and mixed with lime becomes hot. But what and how much each of the causes contributes to the thermal heat and how it brings it forth, we shall explain more fully in the course of the disputation.

XI. Besides the heat, one usually observes also the various qualities and mineral powers of the waters. The question is, whence those thermal waters arise? Answer: Generally from the bodies by which those thermal waters are contained and through which they flow.

XII. If the question is asked in what manner those bodies communicate their powers to the thermal waters, I wish to say: Just as in animals there are parts that contain [others] and those that are contained and emit a force or impetus, so a distinction must be made between parts that are spirit-like, and humid, and solid. It is probable that parts of each kind are communicated to the waters, but in such a way that the vitriol, the sulphur, the alum, and pitch are mixed with their entire substance with

[4] *Causa materialis* and *causa efficiens*, the scholastic expressions for substance and cause of a thing.

the waters, since they easily become liquid. But in regard to metals and stones, because these do not so easily dissolve, particles of them are worn away by friction.

XIII. That spirits are communicated is sufficiently indicated by the odor of the waters, which is the result of exhalations. ||

XIV. That there is something humid in them, or a denser mineral substance, is evident from the taste of those waters which resides especially in a humid watery substance.

XV. That there is a solid substance that is more dense than the humid watery substance in these waters is clear from the ocher which is found in their channels. The pieces of sulphur, quite large, that are found in cisterns show the same thing. Moreover, the same is evident from the rocky substance into which the canals through which these waters pass, harden.

XVI. As to the spirits, it is probable or certain, that the minerals themselves send forth spirits which mix with the waters as they go along. I pass over the fact that the spirits and the exhalations surrounding the minerals penetrate into the pores of the minerals, and this gets imbued and intoxicated with the qualities of the minerals.

XVII. An objection may be raised to the contrary: If a solid and dense substance were communicated to those waters, then the waters would become thick and very turbid, but they are pure. I answer: those parts are communicated, agitated, and separated into very small particles, and for this reason there does not ensue such great thickness as can be discerned by the eye: just as the salt water of the ocean is pure, although it is mixed with the material of the salt. Yet to this I would add that it is true that those waters are of a finer and thinner kind in which a smaller amount of solid substances is mixed. ||

XVIII. Here is another difficulty which can be advanced for the contrary opinion: Metals are too solid to permit small particles to be worn away from them. I answer: This objection is easily set aside by saying that this is false, since the setting free of dust scrapings of gold teaches the contrary. Secondly, the fact that from metals some [particles] can be worn away, is likely from this that those [metals] in the bosom of the earth are not so hard and solid than [as they are] after they have been worked over by art. Thirdly, since falling drops can hollow out stones, it is certain also in regard to stones as it is in regard to metals that by frequent motion some things can be worn away and these [worn away particles] are then mixed with the water in motion. Fourthly, the same is evident from the fact that the exhalations of those waters by their abrasive influence diminish the hardest rocks.

XIX. If in this connection it is asked, whether from the contact with perfect metals, or only with imperfect metals,[5] bodies can take on their qualities? I answer that waters by contact take on the qualities and powers of perfect metals also and that this is demonstrated by rusty water, which flows through veins of ore and licks away adhering rust. The same is true of water which contains inert gold, silver, and chalybs;[6] just as there is in water contained in vessels of copper and lead.

Corollaria.

I.

Are parts of gold heterogeneous? A.

II.

Are iron and chalybs different in species? N.

[5] Georg Agricola (1494-1555) like many of his followers regarded certain new-found metals only as "pictures" of the well-known old ones. Antimon, for example, was the bastard of lead, wismut the bastard of tin (E. Färber, *Die geschichtliche Entwicklung der Chemie*, Berlin, 1921, p. 39). Falloppio (*Opera omnia*, p. 300), speaking of the chemical conceptions of his time, regards two substances, mercury and sulphur, as necessary for the existence of metals, just as the generation of animals requires "menstruus sanguis" and "semen virile." He says, referring to Aristotle: "Ex his itaque duobus, partim a natura, partim ab arte, dicunt Chymistae, posse fieri metalla, primo quidem imperfectiora, deinde perfectissimum, quod est aurum."

[6] Chalybs, iron, iron ore and steel (Aeg. Forcellini, *Lexicon totius Latinitatis*, Pat., 1940, I, 599). Falloppio explains the nature of chalybs in this way: "Fiebat chalybs apud antiquos eodem modo quo etiam fit apud nos. Quando eduxerant ferrum ex terra propria per eliquationem et purgaverant ipsam ex proprio lapide, mittebant ipsum ad alios fornaces, et igniebant saepe, extinguebantque in aquam, et hoc ferrum erat chalybs, ut videre est apud Aristotelem in 4. Metereol. cap. 6, ubi etiam habemus, quod stomoma et chalybs idem sunt."

Sum Ex libr. Henrici Solgii.
Eccl.ae. nov-Ebozacensis

Arnoldi Senguerdii,

Philosophiæ Doctoris ac Professoris Primarii

ATHENÆUM

Amstelodamense,

Plusquam Nonaginta Disputationibus celebertimum.

1216 Q

Disputationum Ordo

Eorumque Nomina, qui respondebunt in hoc

Athenæo Amstelodamensi.

1. De mundo, Resp. Gerard. Bicker à Swieten.
2. — — Resp. Henr. Uurlingio.
3. De Elementis in genere, Resp. Thomâ Bolwerck.
4. * de Materia Corporum natur. R. Jacobo Pricquio.
5. De minimis naturæ, Resp. Petro Witteronge l.
6. * de tribus aëris Regionib. R. Gualtero Schagen.
7. De Comotis, Resp. Nardo de Raedt.
8. De fulmine. Resp. Joh. Lamontio.
9. — — R. Lamberto Hyten.
10. De lapide fulminato. R. Petro Witteronge l.
11. De Meteoris aquëis, Resp. Gor. Bicker à Swieten.
12. De pluviâ, nive & grandine, R. Isac. Rosyerio.
13. De Ventis, Resp. Eduardo Danckers.
13. * De generatione et Corruptione R. Othone Regulo.
14. De motu primo, Resp. Jac. Leite.
15. — — Secunda, Resp. Abrando Coeman.
16. De Coctione, Resp. Isaco Schertzer.
17. De figurâ à pastu Resp. Joh. Schoonhoven.
18. De longævitate Hominum ante diluvium, Resp. Everhard. Lamberti Velio.
19. De Corpore Humano, Resp. Gerardo Soetling.
20. De Partibus corporis Humani in genere, Resp. Michaële à Mosthron.
21. De Cerebro, Resp. Cornelio Backers.
22. De Osse, R. Joh. Braglotio.
23. De Scelete prima, Resp. Ludovico de Keijser.
24. — — Secunda, Resp. Joh. Leon. Blasio.
25. — — Tertia, R. Joh. Leonath.
26. — — quarta, Resp. Ludovico de Keijser.

27 — —

27. — — quinta, Resp. Joh. Leon. Blasio.
28. — — Sexta, Resp. Gisbertus Lucx.
29. — — Septima, Resp. Petro Cleyngio.
30. De Cartilag. nc. Resp. Joh. Bragelio.
31. De ligamentis, Resp. Alardo de Raet.
32. De animâ rationali, Resp. Jacobo Clerq.
33. De Humore prima, Resp. Wolfardo Sonquidio.
34. De Humore altera, Resp. Thomâ Bolwerck.
35. De Tyrannis, Resp. Nicolao Stenonis.
36. De metallis, Resp. Henr. Ulenlingio.
37. De mineralibus Prior, Resp. Isac. Kip.
38. — — Posterior, Pr. Eodem.
39. De lapidibus Prima, Resp. Wilhelm. Arn. Sonquidio.
40. — — Secunda, Pr. Eodem.
41. — — Tertia, Pr. Eodem.
42. — — quarta, Pr. Eodem.
43 — — quinta, Pr. Eodem.
44 — — Sexta, Resp. Eodem.
45. — — Septima Pr. Eodem.
46. Problematica, Resp. Henr. Solingio.
47 — — Resp. Theodoro Ceo.
48. Centuriones Quæstionum Pr. Hermanno Vomelio.
49. — — Pr. Johan. Abolman.
50. Miscellanea, Resp. Christiano Rudmicio.
51. Physica Compendij prima Pr. Wolfardo Sonquidio.
52. — — Secunda, Resp. Eodem.
53. — — Tertia, Pr. Eodem.
54. — — quarta, Pr. Eodem.
55. Centuriones Quæstionum Ethicas & Physicas, Resp. Joh. Laurentio.

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56. De Causis, Resp. Wolfardo Sonquidio.
57. De materia, Resp. Theodoro Clepponburg.
58. De causa Efficiente, Resp. Gerlaco Hoisingio.
59. De prædicabilibus, Resp. Abrahamo Voorsproot.
60. De Signo, Pr. Joh. Bardoci.
61. De Enunciationum affectionibus, Pr. Thomâ Bolwerck.
62. De Syllogismo, Resp. Wilhelmo Arnoldo Sonquidio.
63. De quartâ figurâ Syllogismorum, Pr. Wolf. Sonquidio.
64. De artibus Sophistarum prima, Pr. Johanne Abolman.
65. — — Secunda, Pr. Gualt. Hommâ
66. De Æquivocis, Resp. Gerardo Croesen.

67 De

67. De Comparativis, Resp. Lucâ Schacht.
68. De Exceptivis. Resp. Eduardo Danckert.
69. Logica. Pr. Renato Gubervlo.
70. Continuæ positiones logicæ Pr. Iacoberto Jacobi.
71. — — Pr. Simone Louse.
72. Complectens logicæ partem primam, Pr. Gisberto Kuick.
73. — — Secundam et tertiam Resp. Eodem.

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74. de fortitudine, Resp. Arnoldo Bartzant.
75. de virtutibus Homiletcis, Pr. Ose. de Farreris.
76. de amicitiâ, Pr. Henr. Roijnst.
77. de Societate Conjugali, Pr. Thomâ Bolwerck.
78. de rebus quæstionum, Resp. Joh. Fontaine.
79. Ethicæ Compendij prior. Pr. Gisberto Kuick.
80. — — Posterior, Pr. Eodem.

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81. * Continens quæstiones miscellaneas, Resp. Theodoro Spruyt.
82. — — Resp. Henr. Vennio.
83. Continens positiones miscellas, Pr. Everh. l. Wchio.
84. — — Pr. Henr. Wichinx.
85. positiones miscellaneas. Pr. Joh. ab Hortogvelt.
86. — — Resp. Wolfardo Sangardio.
87. — — Pr. Thomâ Bolwerck.
88. Miscellanea, Resp. Wolfardo Sangardio.
89. — — Resp. Fabricio de Bassocour.
90. — — Resp. Thomâ Bolwerck.
91. — — Resp. Eodem.
92. de rebus Duæ, Resp. Gisberto de Farreris.
93. Specilogium Philosophicum, Resp. Gisberto Kuick.

Disputationes, quibus * Asterismus practicis est, ordine sancti Thomæ ad Hebræum.

FINIS.

DISPUTATIO PHYSICA

De

THERMIS,

Quam

D. D.

Præſide

Clariſſimo, Doctiſſimoque

VIRO,

D. ARNOLDO SENGUERDIO, I. A. M.

Et in Illuſtri Amſtelodamenſium Athenæo Philoſophiæ Profeſſore Primario,

Publicè defendet

NICOLAUS STENONIS Hafnia Danus.

Die 8 Iulii, horis locoque ſolitis.

AMSTELÆDAMI,

Apud JOANNEM RAVESTEINIUM,

Civitatis & Illuſtris Scholæ Typographum, MDCLX.

Clarißimo Doctißimoque Viro,

D. ARNOLDO SENGUERDIO, Philoſophiæ Doctori, ejuſdemque in Illuſtri Amſtelodamenſium Lycæo Profeſſori Primario, Bibliothecæ Præfecto, Scholarumque Publicarum Curatori digniſſimo,

NEC NON

Celeberrimo & Experientißimo Viro,

D. GERARDO LEONARDI BLASIO, Medicinæ Doctori, & in Florentiſſima Amſtelodamenſium Republica Practico feliciſſimo, Medicinam ibidem publicè profitenti,

Illi Præſidi, Huic Hoſpiti, Utriſque Præceptoribus ſuis

Se cum his

offert

NICOLAUS STENONIS.

DISPUTATIO PHYSICA
De
THERMIS,

THESIS. I.

THermarum nomen deducitur à voce θέρω *calefacio*, unde θερμὸς, *calidus*; hinc aquæ, quas jam conſideramus, Thermales dicuntur, quia omnibus vel pleriſque ſaltem illis, vis calefaciendi competit: & quæ frigidæ actu ſunt in terræ ſuperficie, creduntur à Fallopio, in ſui principio, ſive in locis Subterraneis inferioribus, eſſe calidæ: quia tales longo tempore, multis ſcilicet annis, extra proprium fontem immutatæ manent; quod arbitratur fieri non poſſe, niſi aquæ illæ ſint optimè mixtæ: & quia mixtio à calore digerente & concoquente provenit; colligit, illis quoque aquis calorem tribuendum.

II.

Loca in quibus aquæ tales continentur, alio vocabulo *balnea* vocantur, & aquæ ipſæ balneares: quidam tamen inter Thermas & balnea diſtinguunt quod, Thermæ proprie ſint, quas ingredimur ſudandi cauſſa, unde & Sudatoria nominantur: in quæ vero lavandi gratia deſcendimus, proprie ſint balnea, quam litem Grammaticis committimus.

III.

Dicuntur etiam aquæ *metallicæ*, quia pleræque, ſi non omnes ejuſmodi aquæ, metallici aliquid in ſe continent: ob vi m

vim & uſum in negotio medico, nominantur quoque aquæ *medicatæ*.

IV.

Unde Thermæ calorem habeant, res admodum obſcura eſt. Aqua ſua natura eſt frigida, ut vel ex eo certum eſt, quia ſibi relicta, ſublatis cauſis calefacientibus, licet vel ferventiſſima fuerit, rurſum frigida fit. Frigus illud ipſi non imprimi ab aëre, inde conſtat, quia aqua illa fit frigidior aëre, aër vero nequit intenſius frigus aquæ tribuere, quam ipſe habet. Cauſa itaque externa hujus caloris quærenda eſt.

V.

Dicemusne attritionem aquæ & inciſionem frequentem per loca petroſa hujus caloris eſſe cauſſam? Non caret illud omni probabilitate, quia corpora per motum incaleſcunt, &, ſi aliter contingat, hoc accidentarium eſt: ſolent autem petroſa eſſe loca, ubi talium aquarum fontes exiſtunt.

VI.

Huic ſententiæ videtur obſtare, quod, ſi illa foret vera caloris Thermarum cauſa, tum etiam fontanæ aquæ quæ jam frigidæ fluunt, deberent eſſe calidæ, cum & illæ illidantur, agitentur & atterantur per ſaxa & petroſos montes. Hæc difficultas tanti non eſt, quia varii montes conſtant ex lapidibus diverſæ naturæ, figuræ, & variæ juxta poſitionis, ita ut pororum diverſitas quæ inde oritur, & varia lapidum acumina præſtare poſſint, ut ex his montibus lapideis & petroſis, aqua fluat calida; ex aliis vero, in quibus ob pororum magnitudinem & acierum paucitatem, aqua non pari modo ſcinditur, aqua cadat frigida.

VII. Aliud

VII.

Aliud eſt, an calor ille oriatur a ſulphure. Huic obſtat, quod ſulphur in aqua extinguatur, & quamdiu accenſum non eſt, calorem non efficiat, quare videtur quidem materialis cauſæ, non vero efficientis rationem habere poſſe: quod idem de bitumine dici poteſt.

VIII.

Quid ſi dicatur, ignes ſubterraneos per certos tractus ſub gremio terræ diſperſos, calorem hunc efficere, ſive aquis tribuere. Ignes ſubterraneos dari, ſatis conſtat ex montibus ignem evomentibus. Huic opinioni videtur obſtare, quod omnis ignis pabulum requirat, & vix videatur cauſa dari poſſe, quæ indeſinenter ignes illos ſubterraneos foveat, cum bitumen, ſulphur, & quæ plura talia ſunt, incenſione conſumantur.

IX.

An etiam calx & cineres, interræ gremio aquas illas calefacerent. Videmus ignem, calorem & ebullitionem aquæ oriri, cum calci vivæ aqua affunditur. Et hic ſcrupulus eſt, unde tanta calcis quantitas oriri poſſit: tùm etiam quod perennitatis caloris cauſſa hinc vix educatur.

X.

Non videtur à ratione alienum, aſſerere, varias haſce cauſſas concurrere ad calefactionem thermarum: Certum quippe eſt, e corporum motu calorem oriri. Ex abraſione ſulphuris & abraſi agitatione calorem generari, minus negari poteſt, cum calor qui potentia eſt in ſulphure, in actum deducitur. Sulphur in aquis thermalibus dari, præter quam

quod ex odore & ſapore colligatur, certiſſime evincitur è copioſo ſulphure, quod in ciſternis & canalibus thermarum invenitur. Ignes ſubterraneos dari, non poteſt in dubium, propter experientiam, vocari. Aquam agitatam & calci permiſtam, calefieri, ſimili modo certum eſt. Quid autem vel quantum quælibet harum cauſarum ad calorem thermarum conferat, & quo pacto illud preſtet, plenius in ipſo diſputationis conflictu explicabimus.

XI.

Præter calorem variæ qualitates & vires minerales aquarum thermalium obſervari ſolent. Quæritur unde aquæ thermales vires illas nanciſcantur? Reſpondeo generaliter à corporibus, quibus aquæ thermales continentur, & per quæ fluunt.

XII.

Si quæratur de modo, quo illa corpora vires ſuas, aquis thermalibus communicent, dicam: Sicut in animalibus partes dantur continentes, contentæ & impetum facientes, ita diſtinguendum inter partes ſpirituoſas, humidas & ſolidas. Probabile eſt omnis generis partes communicari aquis, ita tamen ut chalcanthum ſulphur, alumen, bitumen omni ſua ſubſtantia miſceantur aquis, cum facile liqueſcant: de metallis vero & lapidibus, quia hæc non tam facile liquantur, particulæ quædam abradantur.

XIII.

Quod Spiritus communicentur, ſatis indicat aquarum odor, cujus ſubjectum eſt halitus.

XVI. Quod

XIV.

Quod humidum ſive craſſior mineralium ſubſtantia in illis detur, patet ex aquarum illarum ſapore, qui præcipue in humido aquoſo reſidet.

XV.

Quod ſubſtantia ſolida, hoc eſt craſſior humido aquoſo, in iiſdem detur aquis, docet ochra quæ in canalibus illorum invenitur. Idem oſtendunt fruſta ſulphuris, ſatis magna, quæ in ciſternis inveniuntur. Præterea idem patet ex ſubſtantia lapidoſa, in quam canales, per quos aquæ tranſeunt, concreſcunt.

XVI.

Quod ad Spiritus attinet, vero ſimile aut certum eſt, & ipſa mineralia de ſe ſpiritus emittere, qui in tranſitu immiſcentur aquis. Prætereo Spiritus & halitus mineralia ambientes, intra poros mineralium ſe inſinuare, & ita qualitatibus mineralium infici & inebriari.

XVII.

In contrarium hoc moveri poteſt: Si ſubſtantia ſolida & craſſa communicaretur illis aquis, tum aquæ craſſæ & turbulentæ fierent: atqui puræ ſunt. *Reſp.* Communicantur illæ partes agitatæ & in exiguas particulas ſecretæ, propter quod non oritur tanta craſſities, quæ viſu diſtinguatur: ſicut aqua ſalſa marina, pura eſt, licet permiſtum habeat corpus ſalis. Huic addo verum tamen eſſe, illas aquas eſſe ſubtiliores & tenuiores, in quibus minus ſubſtantiæ ſolidæ admiſcetur.

XVIII. *Al-*

XVIII.

Altera difficultas quæ pro contraria opinione moveri poteſt, hæc eſt: metalla nimis ſolida ſunt, quam ut ex illis abradi poſſint particulæ. *Reſp.* Hæc facile tollitur dicendo id falſum eſſe, cum contrarium doceant ramentorum auri ejectiones. *Secundo*, Ex metallis quædam facile abradi poſſe, ex eo probabile ſit, quia illa in terræ gremio non ſunt adeo dura & ſolida, quam cum arte elaborata ſunt. *Tertio.* Cum guttæ decidentes cavent ſaxa, certum eſt etiam de lapidibus & ita de metallis, frequenti motu quædam poſſe abradi, quæ motæ aquæ miſcentur. *Quarto.* Idem inde conſtat, quia halitus illarum aquarum abradendo minuunt duriſſimos lapides, quibus illorum canales teguntur.

XIX.

Si hac occaſione quæratur, an etiam ex contactu metallorum perfectorum, an ſolum imperfectorum qualitatibus corpora imbui poſſint? *Reſpondeo*, aquas qualitates & vires ex perfectorum quoque metallorum contactu acquirere, docet aqua æruginoſa, quæ per venas æris fluit, & æruginem adhæreſcentem elambit: idem docet aqua, in qua extinctum aurum, argentum, chalybs: ut & illa, quæ diutius vaſis æneis & plumbeis continetur.

COROLLARIA.

I.

An auri partes ſint heterogeneæ? A.

II.

An ferrum & chalybs differant ſpecie? N.

Total Albinos Among the Cuna Indians

ÖSTEN BJÖRNBERG*

IN total albinism there is complete, or almost complete, absence of melanin in the skin and eyes. The condition is a hereditary anomaly, generally of recessive Mendelian type. Dominant hereditary transmission has been reported, however, mainly in certain Negro tribes. The frequency of albinism in white populations has been stated to be about 1 in 10,000 in North America and 1 in 10,000 to 20,000 in Europe. Among Negro populations in Africa frequencies of 1 in 2,000 to 5,000 usually are reported.

In Panama, particularly on the San Blas islands and along the facing Atlantic coast, and in Colombian territory around the bay of Urabá live the Cuna Indians, who at present number about 20,000. The frequency of albinism among these Indians is one of the highest in the world. As far back as the end of the 17th century, Wafer stated it to be 1 in 200 to 300.[1] Corresponding frequencies calculated in 1925, 1940, and 1957, respectively, were 0.69, 0.47, and 1.50 to 1.75 per cent.[2-4] The Cuna have always been regarded as a pure race, and inbreeding is considerable among the race as a whole and among its constituent tribes.

Cuna Indian albinos have often been called "moon-eyed" or "moon-children," because they were thought to see clearly on moonlight nights. A correct Cuna name for an albino, however, is *ipekwa*. *Kwa* is a common suffix and *ipe* can be traced back to an old word *ipa* for "day," "sun," and from thence "white."[5]

The skin of "moon-children" is white, often with a pink tinge. It is dry and rough and at about the age of 10 becomes wrinkled and creased, particularly on the neck and back. Freckles are common, as are scars and blisters from exposure to the sun. Benign and malignant tumours of the skin are relatively frequent. The scalp hair is white to straw-coloured, sometimes with a reddish tinge, and has a remarkably silky gloss. The face, trunk, and limbs are covered with sparse, light hair. The lips often are protruding and the periorbital tissues are swollen. The iris is yellow, grey, or light blue. Photophobia and nystagmus are almost always present, but other visual anomalies such as amblyopia, ametropia, and strabismus are also common. Many of the "moon-children" are

* Gothenburg, Sweden.

physically underdeveloped, but usually their intelligence is normal. Their expectation of life is shorter than for the normally pigmented Indians.

Because of the photophobia, the "moon-children" cannot tolerate bright sunshine. They therefore pass the day in their huts and do not emerge until twilight. (The Swedish naturalist Linnaeus described albinos in the 18th century as "Homo nocturnus.") Frequently they withdraw from association with the other Indians and become asocial recluses. "Moon-children" have at times been regarded as monsters. Various medicines have been claimed to prevent the birth of albinos. Newborn "white" children have often been killed. Such infanticide is said still to occur to some extent. The earlier, strict laws governing the life of "moon-children," for instance marriage prohibition, have now been lightened.

On the other hand, the "white" Indians have also been regarded as superhuman, associating with the gods and having their own heaven, which normally pigmented Indians could not enter. Albinos have further been credited with power to kill with bow and arrow the dragon that was said to devour the moon during an eclipse.[6] They have even attained the status of chiefs or medicine men.

It is possible that Columbus in 1502, during his fourth journey, saw "moon-children" near Trinidad. Peter Martyr d'Anghera wrote of Indians who passed the expedition in canoes: "These natives are, on the contrary, white and have long, lank hair."

In 1640 Juan Requejo Salcedo compiled a report from the "province of Panama" and repeated statements of the missionary Adrián de Santo Thomás, who three years previously had visited the Cuna Indians. The following extract from the report is given in literal translation: "There are in that province many white and blond as Flemings, which denotes them to be progeny of the first chief, who descended from heaven. Of these are never born other like beings, but *pardos* (that is, brown, dark)."

Lionel Wafer wrote in 1699 of the "moon-children":

> They are not so big as the other Indians; and what is yet more strange, their Eye-lids bend and open in an oblong Figure, pointing downwards at the Corners, and forming an Arch or Figure of a Crescent with the Points downwards. From hence, and from their seeing so clear as they do in a Moonshiny Night, we us'd to call them Moon-ey'd. For they see not very well in the Sun, poring in the clearest Day; their Eyes being but weak, and running with Water if the Sun shine towards them; so that in the Day-time they care not to go abroad, unless it be a cloudy dark Day. Besides they are but

a weak People in comparison of the other, and not very fit for Hunting or other laborious Exercise, nor do they delight in any such. But notwithstanding their being thus sluggish and dull and restive in the Day-time, yet when Moon-shiny nights come, they are all Life and Activity, running abroad, and into the Woods, skipping about like Wild-Bucks; and running as fast by Moon-light, even in the Gloom and Shade of the Woods, as the other Indians by Day, being as nimble as they, tho' not so strong and lusty."[1]

Jules Offroy de La Mettrie in the beginning of the 18th century gave a poetic description of the life of the "moon-children":

"Dans cet isthme qui sépare la Mer du Nord de la Mer Pacifique, on dit qu'on trouve des hommes plus blancs que tous ceux que nous connaissons: leurs cheveux seraient pris pour la laine la plus blanche; leurs yeux, trop faibles pour la lumière du jour, ne s'ouvrent que dans l'obscurité de la nuit. Ils sont dans le genre des hommes ce que sont, parmi les oiseaux, les chauve-souris et les hiboux. Quant l'astre du jour a disparu et laissé la nature dans le deuil et dans le silence; quand tous les autres habitants de la terre accablés de leurs travaux, ou fatigués de leurs plaisirs, se livrent au sommeil, le Darien s'éveille, loue ses Dieux, se réjouit de l'absence d'une lumière insupportable, et vient remplir le vuide de la nature. Il écoute les cris de la chouette avec autant de plaisir que le berger de nos contrées entend le chant de l'alouette, lorsqu'à la première aube, hors de la vue de l'épervier, elle semble chercher dans la nue le jour qui n'est pas encore sur la terre. . . ."

The early and, from the aspect of medical history, interesting accounts of albinism among the Cuna Indians have been confirmed by modern scientific investigations. It is remarkable that reports of the frequency of these albinos exist from as long ago as the 17th century.

ACKNOWLEDGMENT

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A Search for the Real Nathan Smith*

OLIVER S. HAYWARD**

HANOVER, New Hampshire, in 1808 was a strange village. The buildings of Dartmouth College rose in a dignified group to the east. The President's house, tidy but not elaborate, was to the south. There were two or three fine houses to the north and west. This was all except for a few disreputable, windowless, miserable shacks, two of which were inns.[1] The countryside was deep forest, marred by the burn of a recent forest fire, spotted with little farms, their few acres of ploughed ground scratched from primeval forest much of which up to 32 years before had been reserved with the Broad Arrow brand for the masts of His Britannic Majesty's fleet. Since then a few more houses had been built from the trees, a few of the original settlers had died of fever or accidents, families were growing up, and some new settlers were moving in.

Out of the anonymity of this wilderness Dr. Nathan Smith's fame began to grow until it was known in every farmhouse and hamlet. It is known today in his medical schools—Dartmouth, Yale, and the University of Vermont—but only vaguely is it known to most physicians, unless he is remembered as the author of the great monograph on typhoid fever which Osler recommended seventy years later as still the best thing to read on typhoid.

Despite the records which should help to recreate for the interested student the fascinating life and personality of Nathan Smith, his appearance is lost in obscurity. We know that the splendid portrait of him done by Samuel F. B. Morse, presented to Yale by the Class of 1826, was a good likeness, for Smith himself said, "It is homely, homely as the witch of Endor, but I like it."[2] The famous silhouette which has graced the cover of *The Yale Journal of Biology and Medicine* for years in no way resembles the silhouette said to have been made during his lifetime, now in the Dartmouth Archives, and neither one resembles a second silhouette in these Archives. We can only refer to his description as

* Based on the Beaumont Memorial Lecture under the William Carmalt Foundation read on 30 January 1959 to the Beaumont Medical Club, The Historical Library, Yale University School of Medicine.

** New London, New Hampshire.

1 Tully, William. Manuscript Journal 1808. Yale University Library. To be published with Preface by John F. Fulton and introduction by Oliver S. Hayward.

2 Nathan Smith Correspondence. Dartmouth College Archives.

it appears on his passport made out in London in 1797: "The said Nathan Smith is Thirty four years of age, Five feet ten inches (English) in height, blue eyes, small mouth, Aquiline nose, high forehead, round chin, fairish complexion, brown hair and eyebrows, and long face."

Fables grew around Smith even during his life. Two of them (which have appeared in every appraisal of him from 1829 to 1958) can be exploded herewith. First, he was never a captain in the Vermont Militia. "Captain Nathan Smith" was making reports to his Colonel in 1777 when Nathan Smith was *fifteen*. "Captain Nathan Smith" became a lawyer and had some correspondence with Dr. Nathan Smith. Another Nathan Smith is now buried in New Haven Cemetery "a bone's throw" from Dr. Nathan Smith. Yet another Nathan Smith was a town officer at Rehoboth (where Dr. Smith was born) while the latter was a professor at Dartmouth and Yale. Still another Nathan Smith lived in Fairfield, New York, and wrote as a trustee inviting Smith's pupil, Lyman Spalding, to teach at the Fairfield Medical School.

Second, Nathan Smith's thesis for the degree of M.B. at Harvard was not a "Dissertation on Circulation of the Blood," as has often been recorded, but was entitled "Spasm in Fevers." This article appeared in 1791 and was "written by Nathan Smith for his Harvard degree."[3]

But although there has been confusion about some details of his life, there has never been any doubt about his eminence as a physician. When anyone within 50 miles of Hanover had a serious illness or one of the bizarre accidents of the wilderness, he called for Dr. Nathan Smith. And when one of the few other physicians of the countryside diagnosed a resistant dysentery or a distressing tumor, an ununited fracture of the elbow or a depressed fracture of the skull, an osteomyelitis of the tibia or a progressive dropsy, they were apt to call Nathan Smith in consultation.

Along the wood trails and corduroy roads north of Boston, each autumn about two hundred students made their way to Dartmouth College. About half as many students made their way to Dr. Nathan Smith's Medical School, also called the New Hampshire Medical Institution, the Medical Department of Dartmouth University, the Hanover Medical College, etc. Its roster in 1811 showed 124 students coming in about equal numbers from Maine, Massachusetts, and Vermont, 43 from New Hampshire, and a few from Connecticut and elsewhere. Of the total number, 49 were

[3] *Massachusetts Magazine*, 1791, 3, 33-35; 81-83.

members of the College. Some had had almost no formal training, some were graduates of Dartmouth, some of Yale College, some had even graduated from Harvard Medical School and been in practice.[4] One of these students, William Tully,[5] has left in a

CATALOGUE

OF THE

OFFICERS AND STUDENTS

OF

DARTMOUTH MEDICAL THEATRE,

NOVEMBER, 1811.

NATHAN SMITH, M. D. *C. S. M. S. Lond. Prof. Med. & Chem.—Lecturer on Theory & Practice Phys. Surgery, &c.*
CYRUS PERKINS, M. D. *M. M. S. S. Prof. Anat.—Lecturer on Anatomy, Physiology & Obst. Art.*
RUFUS GRAVES, A. M.—*Lecturer on Chemistry.*

Elijah Alexander,	*Hartland,*	Vt.
Joseph Bacheller,	*Fayette,*	D. M.
Joseph Bailey,	*Andover,*	Ms.
Daniel Barker,	*Cheshire,*	Do.
*James Bartlett,	*Salisbury.*	
Edward Barton,	*Weathersfield,*	Con.
William Birchmore,	*Fryeburg,*	D. M.
Asaph L. Bissell,	*Hanover.*	
*John Bixby,	*Dublin.*	
*John Blanchard,	*Peacham,*	Vt.
*Samuel Blood,	*Groton.*	
*Henry Bond,	*Livermore,*	D. M.
*Daniel Breck,	*Hartland,*	Vt.
Nathaniel F. Bruce,	*Weathersfield,*	Con.
Sylvester Bulkley,	*Do.*	Do.
Calvin Carter,	*Lancaster,*	Ms.
Thomas Chadbourn,	*Conway.*	
Jacob Chamberlin,	*Buckstown,*	D. M.
Moses Chandler,	*Fryeburg,*	Do.
*James Chute,	*Rowley,*	Ms.
*Samuel Clark,	*New-Boston.*	
*Augustus Coolidge,	*Boxborough,*	Ms.
Jacob Corey,	*Sturbridge,*	Do.
William Crawford,	*Oakham,*	Do.
*Frederick Cushing,	*Berwick,*	D. M.
Jonas Cutter,	*Jaffrey.*	
Mason Dennison,	*Hartland,*	Vt.
William G. Dickinson,	*Charlestown.*	
John Durker,	*Hanover.*	
Josiah F. Eastman,	*Loudon.*	
*Luke Eastman,	*Hollis.*	
Samuel Elder,	*Northampton,*	Ms.
*Daniel Elliot,	*Dublin.*	
*Benj. F. Farnsworth,	*Bridgeton,*	D. M.
*Samuel Farnsworth,	*Bridgeton,*	Do.
Daniel Favor,	*New-Chester.*	
*Joseph B. Felt,	*Salem,*	Ms.
*Thomas Fessenden,	*Fryeburg,*	D. M.
Luther Fletcher,	*Cavendish,*	Vt.
*Charles Fox,	*Roxbury,*	Ms.
Samuel Freeman,	*Hanover.*	
John Grant,	*Mansfield,*	Con.
*Benjamin F. French,	*Amherst.*	
*Augustus Greele,	*Wilton.*	
*Benjamin Greenleaf,	*Haverhill,*	Ms.
Timothy J. Gridley,	*Middletown,*	Con.
*Sylvanus Guernsey,	*Richmond.*	
Cyrus B. Hamilton,	*Lime.*	
William M. Hand,	*Middletown,*	Con
*Asa Hazen,	*Hartford,*	Vt.
*Benj. F. Heywood,	*Worcester,*	Ms.
*Daniel Hough,	*Lebanon.*	
*John Hubbard,	*Hanover.*	
Andrew Huntington,	*Hanover.*	
Daniel Huntington,	*Stockbridge,*	Vt.
Henry Ingersoll,	*Stockbridge,*	Ms.
*Charles Johnson,	*Haverhill.*	
John W. Kimball,	*Hanover.*	
Nathaniel C. King,	*Rochester,*	Ms.
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*Isaac M'Conihé,	*Merrimac.*	
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Samuel Niles,	*West-Fairlee,*	Do.
*Henry H. Orne,	*Wolfsborough.*	
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Zebulon Rood,	*Barre,*	Vt.
Elijah Rowell,	*Boylston.*	
Richard Russell,	*Fryeburg,*	D. M.
Henry Sargent,	*New-Chester.*	
*Jabez Sargeant,	*Chester,*	Vt.
*Thomas C. Searl,	*Rowley,*	Ms.
*Alpha Shaw,	*Unity.*	
*Jonathan Silsby,	*Acworth.*	
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Martin P. Simpson,	*Hartford,*	Vt.
Aaron Smith,	*Newbury,*	Do.
James Spaulding,	*Sharon,*	Do.
Jehiel Stearns,	*Rockingham,*	Do.
*Jason Steele,	*Randolph,*	Do.
Ruggles Sylvester, M. B.	*Greene,*	D. M.
*Hart Talcott,	*Bolton,*	Con.
Oliver S. Taylor,	*New-Ipswich,*	
Alexander Thayer,	*Charlestown,*	Ms.
Chester Thayer,	*Guildhall,*	Vt.
Daniel Tilden,	*Whitestown,*	N. Y.
Samuel H. Toleman,	*Charlestown,*	Ms.
Benjamin Trask,	*Windsor,*	Vt.
Silas Walker,	*Warner.*	
Young Walker,	*Fryeburg,*	D. M.
Edward Warren,	*Marlborough,*	Ms.
John H. Wells,	*Grafton,*	Vt.
*John Whipple,	*Dunbarton.*	
Pliny White,	*Springfield,*	Vt.
*Samuel White,	*Thetford,*	Do.
*William White,	*Thetford,*	Do.
Obadiah Wilcox,	*Gilsum.*	
*James M'K. Wilkins,	*Amherst.*	
*Henry J. Williams,	*Philadelphia,*	Penn.
Theophilus Wilson,	*Acworth.*	
Alexander Wolcott,	*Middletown,*	Con.
*Frederick Wood,	*Littleton,*	Ms.

Total, 134

* *Members of College.*

CHARLES SPEAR, PRINTER,—*Hanover, N. H.*

FIG. 1. An average class attending Dr. Smith's lectures from 1804 to 1813.

4 Lyman Spalding to William Neil, 28 November 1808. Dartmouth College Archives.
5 Tully, William, *op. cit.*

Journal written in 1808 an account of why he travelled north to Nathan Smith's 19-year-old school rather than going to the well-established medical school in Philadelphia, or the newly important medical school at Harvard. Smith, he said, was a man of genius, a man of great skill and perception, who knew how to pass these attributes along to his students—and besides the school was less expensive. Tully returned for a second year in 1809. Then, after further training he went on, as did many of Smith's students—Lyman Spalding, George Shattuck, Joseph Gallup, Ashbel Smith—to become a professor, respected by *his* students and known as a forward-thinking, creative, inspired teacher and physician.

What was there in Nathan Smith which won him such a distinguished reputation in both medicine and medical education and which led Alan Gregg[6] to call him "The Johnny Appleseed of American Medical Schools" and Herbert Thoms,[7] "the universal genius of his time"? Certainly he was a product of his age. He was born in 1762 at Rehoboth, Massachusetts, now East Providence, Rhode Island, within twenty miles of the birthplace of his great contemporaries, Gilbert Stuart and Benjamin Waterhouse, the latter his instructor and lifelong adversary, the great medical professor at Harvard and the American friend of Jenner, Fothergill, and Lettsom. Like many of his neighbors, Smith had gone north as a child with his family and settled in the upper valley of the Connecticut River in the little Vermont village of Chester where the farms had barely been surveyed out of the wilderness. His father had helped to survey them and was killed by a falling tree while Nathan was still very young. His mother, who later became a popular midwife[8] in the region, seems to have given him most of his education; at any rate he took over the teaching of the grade school—a job requiring a strong right arm and the ability to learn as the class learned.[9]

It was while farming summers and teaching grade school winters that Smith at the age of twenty-three saw an amputation and even assisted when the surgeon, Dr. Josiah Goodhue, asked his aid. Goodhue, though only three years older than Smith, was a skilled surgeon with some experience as a preceptor. His advice that Smith increase his education, particularly in Latin and the humanities,

[6] Alan Gregg to John Sloan Dickey, President of Dartmouth College, April 1948.

[7] Thoms, Herbert. "Nathan Smith." *J. med. Ed.*, 1958, 33, 817-826.

[8] Josiah Goodhue to George C. Shattuck, 4 March 1829. Massachusetts Historical Society.

[9] Bliss, Leonard, Jr. *The history of Rehoboth, Bristol County, Massachusetts.* Boston, 1836.

although it postponed medical studies a year, proved sound, for this training was invaluable to him in later years. One doubts whether without it he could have done so many things so well—met politicians and financiers on equal footing, built several schools of medicine, steered the grants for them through the legislatures of four states, and been the confidant of many of the foremost men of New England.

After studying under Goodhue and trying general practice in Cornish and Claremont, New Hampshire, Smith realized that he needed further training and went to Harvard Medical School for two years, earning an M.B. degree. Here again he was most fortunate, for he studied surgery under John Warren. Warren's training under his brother, Joseph, had been excellent, but his great surgical skill was developed and polished by his years of practice and teaching in the wards of the general hospitals of the Revolutionary Army. Smith's professor of medicine was the contentious Benjamin Waterhouse, a mercurial figure whose vanity and arrogance caused him to quarrel with all his associates and most of his students. Nathan Smith himself successfully sued him in 1795 for $62.27 in a plea of trespass.[10] Waterhouse had his faults, but his assets were many, among them his excellent medical training (probably the best in America) and his great skill as a teacher.[11] A Quaker, he had sat out the Revolution as a student of his uncle, John Fothergill, and later attended the great medical school in Leyden. He had known John Coakley Lettsom and was a Corresponding Member of the London Medical Society. It is not strange that after studying with Waterhouse, Smith found himself in Great Britain, working under Dr. Alexander Monro, *secundus* and Dr. Joseph Black in Scotland and under Lettsom in London. By then Smith had spent ten years in rural practice and was much more mature than Waterhouse had been. Perhaps that is why Waterhouse, though brilliant, became but a contentious nuisance, while Smith, with much the same training, became a far more distinguished physician. Waterhouse saw few patients and those with a certain distaste. "Why they may even call you out to ride 5 miles on horseback in dead of winter," he wrote a friend.[12]

Smith, on the other hand, went anywhere to see anyone with a problem. We can get some idea of his busy schedule from Ezekiel Dodge Cushing's letter in 1809 when he wrote his father of a horse-

[10] Cheshire County Court of Common Pleas. Records. December, 1795.

[11] Trent, J. C. "The London years of Benjamin Waterhouse." *J. Hist. Med.*, 1946, *1*, 25-40.

[12] *Ibid.*, p. 39.

FIG. 2. Silhouette of Nathan Smith said to have been made in his lifetime. Dartmouth College Archives.

FIG. 3. Pelvis of Charles Lowell confirming diagnosis of comminuted fracture of the acetabulum made by Nathan Smith in 1825. Courtesy of Dr. Paul Yakovlev, Warren Museum, Harvard Medical School.

back trip to Barre, Vermont with Dr. Smith—fifty miles in eight hours, with two stops on the way, and arriving at four o'clock in the morning. The call had been an emergency one, and Dr. Smith found an incarcerated hernia. "The Dr. opened the tumour and enlarged the opening through which the gut had passed that it could be pushed back into the belly."[13] Within an hour they were on their way back to Hanover. After what must have been a short night's rest, there were two lectures the next day and then at ten that night a call came to see a boy with a broken leg in Thetford, twelve miles distant. The students joined the Doctor on another strenuous ride, attended to the boy, and arrived home at three o'clock the next morning. Nine hours later they were called out to see a man who had fallen off his horse. "He appeared entirely senseless but still was in great distress, and appeared to suffer as a person does in the night mare. The operation [trepanning] was unsuccessful and the man died. . . ."[14]

Such travel would leave the modern doctor too tired to operate and the modern student too tired to watch. Cushing had been well mounted and spoke proudly of his horse's capabilities, but he was no better mounted than Smith who was said to have had three splendid horses, on any of which he could ride a hundred miles a day. That he sometimes called on them for such exertion is obvious from Cushing's letter and also from one written in 1810 by Alexander Boyd who tells of a trip to Concord (fifty miles away) with Dr. Smith and "upwards of twenty of his students."[15] The group had expected an amputation, but Smith found that the limb could be cured by conservative treatment, so the whole group turned around and raced home. It has been said that Smith instructed the students on the way to such operations, but it is obvious that on the return journey he let them have their heads. If we may believe Boyd, they engaged in races. Boyd says modestly that he was the first to return to Hanover "which I presume was because I had so good a horse."[16] His letter gives us some idea why he and all the other students admired Smith. Not only did the man have the stamina for a hundred-mile horseback ride, not only did he have the good sense to let the young medical gentlemen have sport on the way home, but here was a man who after such a ride could

13 Ezekiel Dodge Cushing to his father, 30 October 1809. Oughterson Collection, Yale Medical Library.

14 *Ibid.*

15 Alexander Boyd to William Boyd, Jr., 26 November 1810. Dartmouth College Archives.

16 *Ibid.*

decide that the good of the patient did not require an amputation, and so turned around and went home having outlined the proper conservative therapy. Surely this is the type of instruction that every medical student even today wants to have.

Smith's fearless skill gave him a deserved reputation in the field of legal medicine. One of his cases illustrates his skill as a pathologist:

> Sometime in September, 1806, Mr. [Benjamin] Fay died and was buried, but as rumors arose that he had been poisoned by his Mother-in-Law, Mrs. Margery Fay, she was arrested and the body exhumed for examination. As most of the physicians present were sure that Mr. Fay had been poisoned, they soon found what they called arsenic. Mrs. Fay was then bound over for trial. Meanwhile, Dr. Smith had heard of the case, and after investigating it, he wrote a paper. . . .[17]

This account was prepared at the behest of the man's friends but was not signed. However, the overzealous group, either ignorantly or wilfully,[18] signed it and sent it to the Walpole newspaper. Smith was usually most circumspect in avoiding public argument with other physicians, but in this case, he told Dr. Spalding, he did not much care, being confident that they merited the censure.

> It was claimed, that the body was found swollen; the pit of the stomach mortified; that the contents of the stomach tarnished a knife blade and when boiled, revealed a metal ball resembling arsenic.
>
> Dr. Smith argued that were people acquainted with the effects of arsenic, nothing could more effectually expose the ignorance and folly of the physicians than a bare recital of their opinions. But as the assertions of medical men frequently obtain more credence than comported with the good of society, he wishes to make a few observations.
>
> 'That Fay died from poison seems to have been inferred from the suddenness of his death though he failed to exhibit a symptom of poisoning. He died in an apoplectic state without evacuations, convulsions, pain or distress, being insensible from the moment he was found indisposed. Compare this with the effects of arsenical poisoning which are nausea, vomiting, purging, hiccough, pain in the stomach, convulsions, twitchings, salivation, asphyxia, and death.
>
> 'That those eminent physicians should find a body SWOLLEN eleven days after burial, should surprise none but themselves, as all other persons know it is due to nature. As to 'Mortification' on the pit of the stomach, how could it have found its way out through the integuments of the body, and like a Night Mare have couched itself on the pit of the stomach! Introduced into court it proved to be a mere scab, the most trifling thing in the world. [The suspicious physicians seem to have given undue significance to the scab of an old scratch they found on the abdomen.]

17 Spalding, J. A. *Dr. Lyman Spalding.* Boston, 1916, pp. 131-132, n. 3.

18 Nathan Smith to Dr. Lyman Spalding, 12 March 1807. New Hampshire Historical Society.

'Then they diagnosed arsenic from the contents of the stomach tarnishing metallic spoons, but the last food the man took, apples, bread and milk will tarnish metals just like arsenic. Their last experiment with a quart of the stomach-contents exposed to firey heat for three hours resulted in a metallic substance in the bottom of the red hot kettle, yet arsenic is so volatile that if there had been a pound of it in the vessel it would have been utterly dissipated with that degree of heat. And after all the metallic button was more likely lead than anything else.

'Thus from the fatuity of the Faculty and the credulity of others, the whole country has been alarmed with the rumor of a horrid murder of which there is no evidence at all. For when the Report is examined by the touchstone of legal evidence it vanishes like a scroll, leaving not the least evidence that the man was poisoned.

'The case shows how careful Judges should be, when life and characters are at stake, in giving credit to the reports and testings of the faculty, at least in matters of opinion depending solely upon their professional knowledge.'—Nathan Smith[19]

By 1825 his reputation was so great that he almost single-handedly won a suit for malpractice for the defendants, two Maine physicians, John Faxon and Micajah Hawks, who had been sued by one Charles Lowell.[20] Dr. John Collins Warren of Boston had said that Lowell's hip had not been properly reduced after it had been dislocated by a horse falling on him. Lowell brought suit in the Maine courts. The worried doctors, aware of Smith's excellent standing in surgery because of his surgical clinics at the newly established medical school at Bowdoin College, asked for his deposition for the defense. The lame, but truculent Lowell was taken to Smith at Bowdoin. He was stripped and most thoroughly examined. "Lines were drawn and proportions measured to ascertain as exactly as possible the situation of the injured parts." Smith questioned the man closely, both as to the circumstances of the accident and his position when the horse fell on him. He reached the conclusion that the hip had never been dislocated, but that there had been a comminuted fracture of the acetabulum, "an injury done to the socket of the thigh bone, accompanied with a derangement of the bones of the pelvis. In that case, it was his opinion, that no effectual aid could be afforded to the patient, except to keep down inflammation." Smith was able to convince both the judge and jury that his diagnosis was correct and the suit was dismissed.

19 Spalding, J. A., *op. cit.*

20 *Report of the trial of an action by Charles Lowell against John Faxon and Micajah Hawks defendants for malpractice in the capacity of physician and surgeon at the Supreme Judicial Court of Maine holden at Machias before the Hon. Nathan Weston, Jun. Portland,* 1825.

John Collins Warren was much disturbed, and several pamphlets were printed, one addressed by him to the judge.[21] When in the course of time Lowell died, Warren was able to obtain an autopsy and the pelvic bones were taken to the Warren Museum. By great good fortune, through the help of Dr. Paul Yakovlev, we have been able to locate Lowell's pelvis in the Warren Museum at Harvard Medical School. It shows a fractured acetabulum.

Nathan Smith was impressed by truth when it came from noted medical authorities, but he was not at all hesitant to argue with them if he thought they erred. Isaac Patterson's description of Smith's lectures shows that he carried this careful judgment into the classroom and that while he spoke with colloquialisms and without the polish of a Waterhouse, he did not fail to cite authorities. "He seemed to hold all the knowledge contained in the Books and in other sources in solution. He would tell you *how far* the authors went and *how far short* they came of imparting full information. This keen observation went far beyond the medical authors of his day."[22] He usually commenced his lectures with some anecdote that happened in his practice. Many of these have been taken down in the students' lecture notebooks which have been preserved in the libraries at Dartmouth and Yale.

A good example of this was such an anecdote recorded by Samuel Elder. Smith told of a Mr. Stockwell, who for some years had had a tumor in the side of his neck. This was about the size of a goose egg and changed in size with moderate pressure. After collapse, it filled as though it were receiving blood from the temporal artery and it was thought for some time to be an aneurism. However, it became increasingly painful and inconvenient and Mr. Stockwell asked for surgical intervention if it would be of any use. Because there was some problem of the diagnosis and because Mr. Stockwell was an extremely inquisitive man, a conversation enlivened most of the operation.

> After Mr. Stockwell was placed on the table and all things ready, the course and length of the incision determined, at the moment when the anxiety of the operator and assistants was at its worst he arose and said, 'Dr. Smith is it best that I should submit to this operation: you see that it is a most critical time as it respects me.' Answer yes. 'Dr. Twitchell is it your opinion also?' Yes. 'Dr. Perkins is it yours?' Yes. 'Are you all agreed?' All, yes. 'If you are disappointed in the appearance at any time let me know

21 Warren, John C. *A letter to the Hon. Isaac Parker, Chief Justice of the Supreme Court of the State of Massachusetts, containing remarks on the dislocation of the hip joint, occasioned by the publication of a trial which took place at Machias, in the State of Maine, June, 1824. Cambridge,* 1826.

22 Isaac Patterson to O. P. Hubbard, 13 October 1879. Dartmouth College Archives.

it.' Through the stages of the operation he frequently inquired, 'are you deceived?' Answer, no. 'Are you all agreed?' Dr. Smith answered the jury are agreed; he says, 'Very well I intend you should be jury but I mean to be Judge Advocate myself.' He bore it without a complaint; on raising him from the table he fainted; he was bent back and soon revived. He died 5 weeks later.[23]

From Nathan Smith's description this was probably an angiosarcoma.

Smith's operations were numerous and varied. He charged moderate prices which would be considered about right for a surgeon practising in New Hampshire today (if we adjust his charges for the value of the dollar at that time). Nonetheless he was a poor man judged by the standards of his neighbors. He never succeeded in building an estate for himself. The reasons for this are manifold. One, without doubt, was his devotion to medical education and his persistence in going where he could do the most good, teaching and practising. The easiest way to appreciate Smith's financial sacrifice is to study the reaction of one of his good pupils, Dr. Amos Twitchell, to the repeated invitations which were showered upon him to become a professor in a medical school. The first of a dozen such requests came from Dartmouth shortly after Smith left. Twitchell was asked to fill the vacant chair of medicine and surgery. His correspondence with the Reverend Francis Brown, President of Dartmouth College, is most illuminating since Twitchell was a man of great skill, well established in his community of Keene, New Hampshire—"my income is about $8,000 per Ann. and am as pleasantly situated perhaps as any practitioner of Physic & Surgery in the State of New Hampshire."[24]

President Brown probably realized how difficult it would be to replace Smith with a man of comparable fame willing to endure the rigors of a New Hampshire life. He therefore tried hard to lure Twitchell with descriptions of the fame and increased practice resulting from a professorship and virtually promised $1,000 a year from the students. Twitchell in reply said that the $1,000 a year would be paid in greater part in students' notes which in his hands would not be worth fifty per cent. This was a most accurate estimate, since Smith had found them not worth more either. Twitchell then pointed out that the financial loss to his practice from teaching would be great:

23 Samuel Elder Notebook. Dartmouth College Archives.

24 Amos Twitchell to the Rev. Francis Brown, 12 August 1819. Dartmouth College Archives.

> Had you funds sufficient to give your professors a suitable salary no person qualified for the office would hesitate in accepting an appointment, besides they then could be more useful to the institution by devoting their time & talents more exclusively to its promotion. But circumstanced as you are, where the only salary you can afford your Medical professors, is what they can obtain from young men, who are struggling hard with poverty in the persuit of a profession, it cannot be expected that any one situated as I now am should feel willing to accept of the office.[25]

Twitchell did not mention other drawbacks to the professorship—the need to deal with state legislatures and with sometimes unsympathetic boards of trustees. Smith, however, was well aware that the problem of maintaining a good medical school was intimately connected with the popular support of state and college. He was able to put grants for four separate medical schools through four different state legislatures, and when he had done this he rested on his laurels. In a letter to George Shattuck he gave an opinion, which would still be correct today, that for the most part each New England state could support a medical school. "Any State should have one medical school and no more. A medical school does more toward ameliorating conditions of mankind than any other institution as the knowledge acquired in them is of more practical importance."[26]

Smith's experience with legislatures was not limited to obtaining grants. While in New Hampshire he had tried to improve control over the practice of medicine with the institution of licensing practices and laws to curb quackery. He was in a constant struggle over the problems of teaching anatomy. Dissection of the human body was nowhere legal at the time,[27] Massachusetts passing its first law regulating the study of anatomy in 1832 and New Hampshire following suit in the same year. Shortly after he went to the new Medical Institution at Yale, there was a popular disturbance because of the dissection of a pauper. Such a situation was no longer Nathan Smith's concern, it being the duty of the Professor of Anatomy, Dr. Knight, to take care of such problems. However, all the Faculty knew that Smith had ridden out many such storms (in one of which the Courts of Massachusetts had found one of his students guilty and had only narrowly refrained from indicting Smith himself on such a charge) and they insisted that he too appear before the Legislature.

25 Amos Twitchell to the Rev. Francis Brown, 28 June, 1819. Dartmouth College Archives.

26 Nathan Smith to George C. Shattuck, 18 April 1823. Yale University Library.

27 *Address to the community on the necessity of legalizing the study of anatomy by order of the Massachusetts Medical Society. A Committee of A. L. Peirson, John C. Warren, George C. Shattuck, John Ware, Nehemiah Cutter, et al.* Boston, 1829.

[Dr. Knight] had so much reliance on my former experience in such cases that I could not prevail on him to go an inch without me. So I had to go on and meet the mob in town meeting who treated us with great civility and as it so happened that I knew nothing of the matter and having bowed very respectfully to those we hate they suffered me to part and appeared very well satisfied.[28]

A previous episode in Hanover in 1809 had been a little more exciting. The medical students in a rather unusual spirit of caution had employed Dartmouth College students to act for them. Perhaps they were influenced by the New Hampshire law which was "more severe than in Massachusetts, the penalty being $2,000. fine, two years' imprisonment, setting on the gallows, 150 lashes."[29] The College students were not as artful as they might have been and on their trip back with the body one of them left behind at the toll house his pocketbook which contained the anonymous note from some informer telling where a body could be found. Naturally the townspeople went to this place and found a grave freshly disturbed. A mob was roused, the Sheriff was called out to lead it, and the angry group descended on the new Dartmouth medical building. They were a little late, for most of the dissection had been finished the night before. (Anatomists were not in the habit of leaving such work for a later time; once a body was secured, and without benefit of fixative, they usually went to work promptly.) Smith had just finished building his fine brick schoolhouse, and the doors were stout enough to hold off the mob until the body had been hidden in an obscure closet. Smith handed his pistols to the student who narrates the episode, Ezekiel Dodge Cushing, and then retired, leaving Cushing and another student, Sylvester, in charge.

These students opened the door to the mob with what calmness they could muster and showed them over the new building. The Sheriff, as was often the case, was an intelligent man who realized that to have doctors one must have medical students, and to have medical students properly taught one must have dissections. He therefore showed more interest in the equipment of the new building than in the search for the body. However, the mob probed and poked about and finally found the closet. When its disconcerting contents were found, the mob was kept from wrecking the new building only by the great presence of mind of Cushing who showed his pistols at the proper moment and threatened a counter-attack by the 124 angry students of Dr. Smith. In a more placating

[28] Nathan Smith to Mills Olcott, May 1819. Dartmouth College Archives.
[29] Ezekiel Dodge Cushing to his father, 2 December 1809. Oughterson Collection, Yale Medical Library.

tone, he then offered to sew up the body and restore it as far as possible to its original form.

> They finally agreed and we then went to work and put all the parts together as neat as possible, the men grew good natured and perhaps it is all over. I had much ado to persuade the father of the child not to see it. They got a coffin and have gone home, not without stopping and telling the whole story at the tavern, and they threatened to expose the body to public view as soon as they got home. If they do it is probable that a mob will be raised. The Dr. says I have acted nobly and in nothing amiss.[30]

The outcome of this case was that Cushing was indicted in Massachusetts and forced to appear in Court there. He completely absolved Nathan Smith of any complicity in the case, and the Court agreed with his testimony.

Smith overcame a hundred such difficulties; but he never solved the problem of getting rich. He left his family no money, nothing but a little unmortgaged house in New Haven where his wife could live in peace and comfort. He left her and all the world a rich heritage of memories and a new outlook on the difficult medical problems of the future.

The medical profession in Smith's time, as it is on occasion even today, was confused by folklore, quackery, undue reliance on complicated mixtures of overrated inert herbs and underrated viciously potent herbs. In addition there was the elusive biological philosophy of the time which encouraged bloodletting, purging, and the like. American medicine was just beginning to be stimulated by a clear, keen light from abroad where the spirit of the Renaissance genius of Vesalius had filtered through the centuries to Leyden and thence to Edinburgh, London, and Paris. Smith's studies under Waterhouse and more particularly under Lettsom were illuminated by the teachings of Fothergill and the Leyden school of Boerhaave. Much of the wisdom and iconoclastic outlook of Fothergill can be seen in Smith and his students. He did much to reduce pernicious medical practices in a whole generation.

He urged his students to treat each case individually and to give such medicine as seemed to be required by the symptoms rather than to give medicine to weaken a patient in accordance with a philosophical view of disease which was not only wrong, but was illogical and completely nonindividualized. Smith taught that diseases need not be treated only in the manner fixed by Hippocrates, but that all disease had features which could be met, measured, and mastered. Smith's teaching at Dartmouth and Yale

30 *Ibid.*

is well described by Sherrington who, six generations later, was speaking of the philosophy of instruction at Oxford. "Here at Oxford we think we have learned how to teach what is known. But now with the undeniable upsurge of scientific research, we cannot continue to rely on this, but must learn how to teach the attitude to what is not yet known."[31]

How well Smith was able to do this is shown in the careers of his pupils. Not by chance did Twitchell, Tully, Kirtland, Shattuck, Spalding, Gallup, and Ashbel Smith take over high places in American education and professional life. They had been inspired to do original work of their own. The modern student, reading Smith's accounts of disease and observing his efforts to bring order out of disorder and therapeutic benefit out of the witch's caldron of the pharmacopoeia cannot help but be inspired to go forth and battle the similar confusion of today with the patient's good his sole and necessary guide.

31 Gregg, Alan. *For future doctors.* Chicago, The University of Chicago Press, 1957, p. 159.

The Cure of Elf-Disease in Animals

THOMAS DAVIDSON*

THIS paper outlines the beliefs associated with Elf-shot and the influence these had on the treatment of animal disease. The subject may conveniently be introduced and partially defined by way of two examples. In the late autumn of 1884 a Buchan farmer was heard to complain of the death of a "fine stirk by elf-shot." When asked whether it might not have been due to quarter-ill,[1] he replied: ". . . that could not be, my neighbour and me opened up the beast, and there was a hole through his heart."[2] Some few years before in 1867 a Mr. Hew Morrison saw a cow which was said to have been killed by the elf-shot. When he pointed out to the farmer that her death had been caused by rolling over in such a way that her long horns had penetrated the ground and so kept her in a position from which she could not rise, he was told that was the common way in which cows fall when struck by the *saighead sithe* or fairy arrow.[3]

Elf-shot was the disease inflicted on an animal by an elf arrow. The symptoms, as will be shown later, varied on a geographical basis, but in every case the ailment was thought susceptible of cure. But before discussing the symptoms and means of cure, it is important clearly to establish the beliefs regarding their origin.

The material, particularly for Scotland and Ireland, is so extensive that it is necessary to summarize it somewhat severely. The origin of these arrows, elf-stone, elf-bolts, or fairy-darts, in reality neolithic flints (Figure 1), was shrouded in complete mystery and as a consequence considerable supernatural powers and virtues were ascribed to them.

Plot, the Oxfordshire naturalist, in 1677 wrote: ". . . besides the Brontise, i.e., thunderbolts, of the foreign naturalists we have others, which here in England we call likewise Thunderbolts, in the form of arrow heads, and thought by the vulgar to be indeed the darts of Heaven." The uniformity of their shape attracted attention and the Rev. John Fraser, in a letter to Wodrow dated

* Coulsdon, Surrey, England.

1 Quarter ill, or quarter evil or blackleg, is an acute infection of cattle and sheep due to *clostridium chauvei* or *clostridium septique*, usually characterised by crepitant swelling in the muscles of the infected part.

2 *Scottish Notes and Queries*, Aberdeen. 1892, *1st ser.* 5, 178.

3 Morrison, H. Notes on donations to the National Museum of Antiquities of Scotland. *Proc. Soc. Antiquaries of Scotland*, 1881-1882, *16*, 177-178.

1702, thought it strange "that these elf-stones, whether little or mickle hes still the same figure, though certainly knowen to fall from the aire. The commonality superstitiously imagines that the fairies hath made and gives them that shape, and that they doe hurt by them, which we call elf-shot."[4] Similarly, Kirk describes the weapons as being "like to a Soft Flint Spa, shaped like a barbed Arrow-head, but flung like a Dairt with great Force. These Armes (cut by Airt and Tools it seems beyond humane) have something of the Nature of Thunderbolt Subtility, and mortally wounding the vital Parts without breaking the skin."[5]

Lhwyd, Keeper of the Ashmolean Museum, appears to have been one of the first to recognise that they were indeed the weapons of early man. In a letter dated Linlithgow in Scotland 17 December 1699 he says:

> I doubt not but you have often seen (some) of these Arrow-heads they ascribe to Elfs or Fairies: They are just the same chip'd Flints the Natives of New England head their Arrows with as this Day. . . . These Elf-Arrow-heads have not been used as Amulets above thirty or forty years. Whence I gather they were not invented for Charms, but were once used in shooting here as they are still in America. The most curious as well as the Vulgar throughout this Country are satisfied they often drop out of the Air, being shot by Fairies, and relate many instances of it, but for my part I must crave leave to suspend my faith, until I see one of them descend.[6]

The arrow was shot with such magical dexterity that the wounds inflicted was very difficult to find. Kirk, referring to experience in the Scottish midlands, goes so far as to say that the blows delivered by these weapons inflicted no wound, although the spot struck by them might be discovered with great difficulty, for no external blemish was visible.[7] This was also accredited in Ireland where "you may feel a hole in the flesh, but not in the skin where the cow has been struck."[8] In the lowlands of Scotland a farmer could take a blue bonnet that had been worn by the oldest member of the family, and with it "rub the cow all over, and the wound will make its appearance or the place will be seen where the wound has been, although whole."[9]

The symptoms varied in different districts and from one country to another. A case of witchcraft in Bute in 1662 seems to reveal

4 Dalyell, J. G. *The darker superstitions of Scotland.* Glasgow, 1835, pp. 356-357.
5 Kirk, R. *The secret commonwealth of elves, fauns and fairies.* London, 1893, p. 19.
6 Llwyd, E. Extracts of several letters from Mr. Edward Llwyd concerning observations made in his travels thro' Wales and Scotland. *Philos. Trans.,* 1719, *28,* 89-100.
7 Kirk, R., *ibid.,* pp. 19-21.
8 Black, G. F. Scottish charms and amulets. *Proc. Soc. Antiquaries of Scotland,* 1892-1893, *27,* 466.
9 Henderson, W. *Folklore of the northern counties of England and the borders.* London, 1879, p. 185.

the reality of the belief and danger to man and beast: ". . . quhen they are shott there is no discovery for it and if the shott be in the heart they dies presently, but if it be not in the heart they will die in a while with it."[10] In general, however, the symptoms were dwindling herds, loss of milk or inferior milk, sudden cramp and seizure. In Caithness, for example, an elf-shot cow "refuses its food, looks languid, and breathes hard."[11] In England "the diesease (elf) in horned cattle caused an over-distention of the first stomach from the swelling of clover and grass when eaten with the morning dew upon it,"[12] and in Ireland "the animals' hair stands up on her back, her ears lifeless and hanging."[13] An interesting variant description, but one reflecting the contemporary belief regarding fairy theft and changelings, is recorded for the Shetlands. There it was thought that when a cow or sheep was sick, it had been shot with an elf-arrow, the real animal had been "taken away," and a fairy animal left in its place.[14]

The cures and counter charms adopted were many and the entire gamut of superstitions was run to provide means to thwart the fairy and arrest the disease. The materials and method of the cures were never consistent, always irrational, and consisted in the main of a confusion of charms, amulets, invocations, and incantations—these last incorporating, often with complete impartiality, Christian and pagan prayers.

Kirk's cure was very simple indeed, it was "only for a man to find out the Hole with his Finger; as if the spirit flowing in a Man's warme Hand were Anti-dote sufficient against their poyson'd Dairts."[15] A crofter in Dunrossness, Shetlands, who had a cow that suddenly turned ill and seemed about to die, called in an old woman, a celebrated *trowist* who, after a careful examination, discovered a small dimple in the skin just opposite its heart. "My bairn," she said, turning to the crofter, "da trows is shot her. Hass dee a Bible i da hoose at du cud bring me?" The Bible was produced and she slowly turned over several of its leaves. Suddenly she tore one out. "I sale tak a verse oot o' dis leaf, and whatin a verse dat is none knows bit me, for it's a saecret, an dem at wid be weel sud never middle wi' things as dey ken no o'." She tore out a

10 Macphail, J. R. N., Ed. *Highland papers: witchcraft in Bute.* Edinburgh, 1920.3, p. 27.
11 Henderson, J. *General view of the agriculture of Caithness.* London, 1812, p. 204.
12 Hardy, J. *The Denham tracts.* London, 1892-1895, II, p. 113.
13 Meechan, J. The cure of elf shooting in the north west of Ireland. *Folk-lore, London,* 1906, *17,* 200.
14 *New statistical account of Scotland.* Shetland, Edinburgh, 1841-1843, p. 142.
15 Kirk, R., *ibid.,* p. 77.

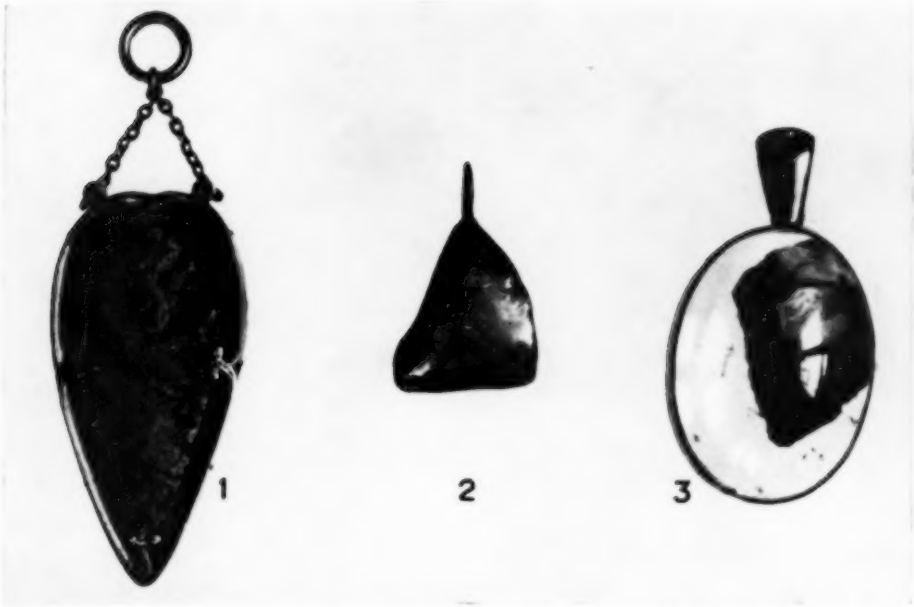

PLATE 1. Elf-arrow Amulets from Scotland:

1. Elf-arrow mounted in nineteenth century gold and enamel pendant inscribed *saighead sithe.*

2. Elf-arrow of bluish agate, lozenge-shaped, mounted in silver for suspension. Engraved K/1M. Preserved by the Stewarts of Garth, Fortingall, Perthshire.

3. Elf-arrow mounted as an oval gold pendant box—late eighteenth century.

Specimens in National Museum of Antiquities of Scotland, Edinburgh.

verse rolled the tiny scrap of paper into a pellet and pressed it into the dimple. After a short time she retrieved the pellet, the torn leaf and Bible, and departed assuring the crofter that his cow would recover.[16]

A variant prescription from the same area directs the farmer to take tar, a needle, a Bible, a firebrand, and some "fairy" crabs; Waving the burning brand he was to walk three times "widdershins"[17] round the cow, jabbing the animal with the needle, waving a leaf of the Bible over its back, and muttering an incantation. The firebrand was then to be placed in a pot of tar and set at the cow's head, so that the fumes would make her cough. She was then to be given the "fairy" crabs to eat alive. Finally, the ashes of the firebrand were to be later mixed with the tar into three pills, which should be administered to the animal on three successive mornings.[18] In the parishes of Sandsting and Aithsting, cure was effected by folding a sewing-needle in a leaf taken from a particular part of a psalm book and securing it in the hair of the cow. This was considered not only an infallible cure, but served also as a charm against future attacks.[19]

In Caithness the cow that refuses food is handled in a similar way. The cow-doctor rubs and searches the hide of the beast for holes, not in the hide but in the membrane under it. These he rubs well with his fingers and bathes them with salt and water. When all the holes are thus found out and rubbed, two tablespoonfuls of salt are dissolved in half a Scotch pint of cold water and a little of it poured in the ears, the remainder is poured down its throat. Silver is often added to the water while the salt is dissolving in it.[20] An exactly similar procedure is recorded for Sutherland about 1885.[21] Further south in Aberdeenshire the injury was bathed with a preparation of salt and tar, or sometimes the wound was treated with salt dissolved in water in which an elf-arrow had been dipped. This as a drench was also poured down the animals throat, and in about half an hour it usually recovered.[22]

A flat whorl of hard sandstone, the property of a famous witch Meg Elson who lived in the Fingaul district of Kirkmaiden, was

16 Burgess, J. J. H. Shetland folklore. *Scottish Rev.*, 1895, 25, 91-103.

17 Widdershins is to turn around or perambulate in a direction contrary to the course of the sun, i.e., anti-clockwise.

18 Spence, J. *Shetland folklore.* Lerwick, 1899, pp. 144-146.

19 *Op. cit.* (note 13), p. 141.

20 Henderson, W., *ibid.*, p. 204.

21 Davidson, J. M. Bow'd rigs. *Proc. Scottish Anthropological and Folklore Society*, 1948, 3, 82.

22 Logan, J. *The Scottish gael.* London, 1831, II, pp. 339-341.

used for curing the elf-shot in cattle. A red woollen thread was put through the hole, and it was dipped three times in water taken from a well on which the sun did not shine, by a young girl with red or yellow hair. A rhyme in Gaelic was said over the water which was then given to the cow to drink.[23] Another made of steatite, at one time the property of the Clan Caskill at Bracadale, Skye, was used more simply by dipping it in water which was afterwards given to the cattle to drink. Apparently in 1885 the Free Kirk minister of Bracadale, determined to root out what he considered the devil and his superstitious rites, ordered the people to deliver up all the elf-shot charms they had in their possession. It is said that he got two creels full of them which he dumped in the middle of Dunvegan Loch.[24] Amber beads were used as late as 1845 in the highlands of Scotland. Worn as a charm on a ribbon they were dipped three times in water which was given to sick beasts;[25] and in the same area spindle whorls found in brochs were tied between the horns of cattle on the first night of the quarter.[26]

In Ireland the medicinal use of the flint arrow head has been known for two centuries. In 1709 we find mention of a 'thunderbolt' being used in Kerry, and down to 1865 the Irish in and around County Antrim continued to put arrow heads into watertroughs at which they watered their cattle.[27]

Wood-Martin speaks of a cow doctor in Ireland who invariably found that the animal was either 'elf-shot' or 'dinted,' or it might be suffering from both troubles. 'Elf-shot' was when the arrow had actually pierced the hide, 'dinted' was when there was only an indentation, which, however, could be located and felt. He prescribed gruel and into it put some arrow-heads together with a piece of silver and some soot. When all had been boiled well together, he took a mouthful and blew it into the animal's ears, another mouthful which he blew over her back. The remainder he gave to the animal to drink.[28]

In County Derry the cure is similar to one found in the south of Scotland. "The wise-man boils in a clean pan a pound of gunpowder and a crooked sixpence. This is placed before the cow, and she is made to drink the mixture. The gunpowder immediately blows the elf-arrow out through the hole, and the sixpence

23 Black, G. F. Scottish charms and amulets. *Proc. Soc. Antiquaries of Scotland,* 1892-1893, 27, 473 .
24 *Ibid.,* 474.
25 *Ibid.,* 476-477.
26 Lovett, E. Veterinary leechcraft. *Folklore,* London, 1905, *16,* 335-336.
27 Westropp, T. J. Folklore of county Clare. *Folklore,* London, 1911, 22, 53.
28 Wood-Martin, W. G. *Traces of the elder faiths of Ireland.* 1902, I, pp. 41-42.

fitting on the heart, covers the wound made by the stone." The record adds, "if after the treatment the cow does not recover, she dies because God chooses it, and not from the elf-shot."[29]

The "elf-doctor," as he was called in the northwest of Ireland, provided himself with a silverpiece known as "the thirteen pence piece" with a cross on it, several flints, and three bad halfpence. As a preliminary step he took measurements of the cow's back; if it did not fall into three equal measurements each of which must be the length from the "doctors" middle finger to his elbow, it was further proof of elf-shot. He took the juice of the herb *Alchemilla vulgaris*—"Ladys mantle," and placed it in a pail with water scooped up against the flow of the stream where three townlands met. The coins and one flint were added to the mixture, and the cow had to swallow three sups of this. Some of it was then poured down her spine and massaged in with some of the dirt from her forefeet. The last drops were cast into her ears.[30]

In the North of England the "elf-shotten" animal was cured by touching it with one of these arrows and administering as a drench water in which an elf-arrow had been dipped;[31] and a simple cure for calves was to rub their mouths, lips, and nose with their own dung.[32]

Where elf-arrows were used in Scotland as cures, certain precautions had to be taken. Sir John Evans quotes Dr. Hill Burton as saying that it was an article of faith in Scotland so late as 1872 "that elf-bolts, after finding, should not be exposed to the sun."[33] As late as 1909 there is a record of an old man in Kirkcudbrightshire who had in his possession for 30 years a fairy arrow which he kept as a safeguard against the fairy. 'It would,' he said, 'lose its efficacy were it to touch the ground.'[34]

Carmichael in his collection of charms and prayers from the highlands of Scotland gives two hymns to Brigit in which are illusions to elf-shot. The first is a herding blessing:

> Arise, thou Bride, the gentle, the fair,
> Since thou to them mad'st the rich charm,
> To keep them from straying, to save them from harm,
> From rocks, from drifts, from streams,
> From the *straight arrows of the slender ban-shee,*
> From the heart of envy, from the eye of evil.[35]

29 Henderson, W., *ibid.*, pp. 186-187.
30 Meehan, J., *ibid.*, pp. 200-210.
31 Spence, L. *The fairy tradition in Britain.* London, 1948, p. 175.
32 Brand, J. *Observations on the popular antiquities.* London, 1841-1842, pp. 401-403.
33 Evans, J. *Ancient stone implements of Great Britain.* London, 1872, p. 326.
34 Spence, L., *ibid.*, p. 173.
35 Carmichael, A. *Carmina gadelica.* Edinburgh, 1900, I, p. 279.

And again:

> Every day and every night
> That I say the genealogy of Bride,
> I shall not be killed, I shall not be harried
> No fire, no sun, no moon shall burn me,
> No lake, no water, no sea, shall drown me,
> *No arrow of fairy, no dart of fay,* shall wound me,
> Under the protection of my Holy Mary
> And my gentle foster-mother is my beloved Bride.[36]

The beliefs were widely spread throughout Northern Europe, and the many Finnish charms to discover the cause of disease and to protect against disease illustrate their belief in elf-shot as the cause. For example, 'to still violence': 'With what shall I the elf-shot squeeze, with what extract the sorcerer's bolts? Only yesterday I was in company with smiths, I got made for me little tongs with which I'll lift the sorcerer's bolts. More dreadful are a dead man's hands, with them shall I the elf-shots squeeze tightly compress the fairy darts.'[37]

Scattered throughout the pages of Anglo-Saxon MSS concerning leechdoms, remedies, and recipes we find charm cures for elf-shot in man and cattle, in the form of pagan and Christianised-pagan prayers, narrative chants, and simple recipes. In the collection designated *Lacnunga* by Cockayne is given a simple elf-shot recipe. 'For sudden stitch: Feverfue, and the red nettle that growth through into a house, and waybroad. Boil in butter.'[38]

Feverfue or fever-few is the Anglo-Saxon name for the well-known plant pyrethrum parthenium and is borrowed from the Latin febrifugia, a febri fuge or 'fever-chaser.' Red nettle is familiar and way-broad or way-bread is the plantain.

Following on this is a narrative charm in the form of a pagan lay against elf-shot:

> Loud were they, yea loud, when they rode over the hill;
> Fierce were they when they rode over the land.
> Shield thou thee now: then mayest thou survive this onset.
> Our little spear, if herein thou be.
> Stood he under the linden (shield) under the light shield,
> Where the mightly women got ready their powers,
> And the whizzing darts they sent.
> I back to them will send another,
> A flying shaft in defence against them.
> Our little spear, if herein it be,

[36] *Ibid.*, p. 175.
[37] Bonser, W. Magical practices against the elves. *Folk-lore*, London, 1926, *37*, 354-355.
[38] Cockayne, O. *Leechdoms, wortcunning and starcraft of early England.* London, 1864-3, p. 53.

Sat a smith, a knife he sledged,
Small the iron, woeful the wound.
Six smiths sat; battle spears they wrought.
Out, little spear! not in, spear!
If herein be of iron a fragment,
Hag's work, it shall melt away.
If though wert shot in skin, or shot in flesh,
Or shot in blood, or shot in bone,
Or shot in limb, may thy life ne'er be shattered.
Were it Aesir Shot, or Elves' shot
Or Hag's Shot, now will I help thee.
This is thy cure of Aesir Shot; this to thy cure of Elves' Shot;
This is thy cure of Hag's Shot; I will help thee.[39]

In the following two cures for elf-shot horses, the first is a simple pagan recipe, while the second provides clear evidence of the deliberate determination of Christianity to modify and incorporate the ancient pagan superstitions into her own ritual.

If a horse be elf-shot, then take the knife of which the haft is horn of a fallow ox, and on which are three brass nails, then write upon the horses forehead Christs mark, and on each of the limbs which thou may feel at: then take the left ear, prick a hole in it in silence; this thou shalt do; then take a yerd, strike the horse on the back, then will it be hole. And write upon the horn of the knife these words, *"Benedicite, omnia opera domine, dominum."* Be the elf what it may, this is mightly for him to amends.[40]

If a horse is "shot": May the beasts on the earth be healed; they are shaken indeed in health In the name of God the Father and of the Son and of the Holy Ghost may the devil be cast forth by the laying-on of our hands. Who shall seperate us from the love of Christ by the invocatior of all thy Saints, by Him who liveth and reigneth ever without end, Amen. Lord, wherefore are they increased thrice; Rejoice, loose their chains, O Lord, thrice.[41]

During her trial for witchcraft in 1607, Barbara Paterson in Newbattle, Midlothian, confessed using the following charm to cure elf-shot cattle:

'I charm thé for arrow-schot,
For dor-schot, for wondo-schot,
For ey-schot, for tung-schot,
For hert-schot, all the maist,
In the name of the Father, the Sone and the Haly Gaist,
To went out of flesh and bone,
In to sck and stane
In the name of the Father, the Sone and the Haly Gaist.'[42]

[39] Grattan, J. H. G. and Singer, C. *Anglo Saxon magic and medicine*. London, 1952, p. 175.

[40] Cockayne, *ibid.*, II, p. 291.

[41] Grattan and Singer, *ibid.*, p. 185.

[42] Pitcairn, R. *The criminal trials in Scotland*. Edinburgh, 1833, 2, pp. 535-536.

Dalyell cites Scheffer who, explaining the word "skott" observes, "if a creature be suddenly struck down by a disease exhausting his strength, or proving almost fatal, the vulgar describe it to magic, calling it skott, that is, a dart, which is the cause."[43] As used in Scotland, shot generally means struck down, and 'I charme three for arrow schot' probably denotes the same interpretation.

It is significant and not without interest to record here the association between elf-shot and the once common, but now fast disappearing, feature of the British landscape, namely, curving plough strips.

Throughout most of the counties of Scotland and the north of England there are still a large number of fields showing a peculiar but similar curved plough strip or crooked ridge pattern. This strip, Scottish "rig," denotes the strip of earth, about 15 feet wide, cast up by the plough between groups of furrows. In the Kilbirnie district of Ayrshire where such crooked ridges are very common, Smith observes 'that on the hills there are marks of ancient cultivation know as elf-furrows.'[44] The crooked line of these was thought to confuse or 'wander the fairy,' and in Durham, England 'some old pasture fields displayed twisted ridges cast up by the plough . . . a precaution against the fairies shooting at the oxen which drew the plough.'[45]

The fairies, imagining the furrows to be straight, sighted along them only to be baulked by their curvature. The Scottish examples, 'bow'd rigs' as they were termed, are found in a wide variety of shapes—elongated and reversed S-shape, wide arc, deep and shallow bows, crooked, and fan shaped. One aged local farmer in the Slamannan district when questioned on the reason for ploughing to this pattern replied that it was "to wander the fairies . . . so that they couldna' shoot straucht." "It was bad luck," he continued, "even to try to plough the rigs out and those who had endeavoured to do so had had nothing but the worst luck afterwards. Crops would never grow on their land again. He knew because he had seen folk trying to plough them out."[46] The last case of ploughing bowed rigs deliberately to wander the fairies comes from Lanarkshire in Scotland where remains of the rigs are still to be seen.[47]

Such were a few of the rites carried out in an endeavour either to cure or arrest the disease caused by the elf-shot. The examples

43 Dalyell, J. G., *ibid.*, p. 355.
44 Davidson, J. M., *ibid.*, p. 82.
45 Hardy, J., *ibid., II*, p. 146.
46 *Ibid.*, II, p. 77.
47 Davidson, J. M., *ibid.*, III, p. 75.

chosen suffice to show the overpowering influence of the supernatural, and once the supernatural origin of these flints was firmly fixed in the peasant mind, it naturally followed that they became the objects of suspicion and fear. And in this passive acceptance of the supernatural we have perhaps a continuation of the most primitive belief that all natural phenomena were the work of unseen spirits to whom were attributed all the ills that beset mankind. The closely associated beliefs of the fairy with the soil, the sacrosanct nature of fairy soil, and the evidence for fairy cattlemen and agriculturists all tended towards a common focal point for attributing to them the particular ills that beset the farmer. When his cattle oxen or horses in which his very existence was bound up were threatened with a disease that defied regular diagnosis, how natural it was for him to resort to superstitious aids.

With the exception of the pagan incantations which were modified and adapted to conform to post-Christian ritual and became hymns, prayers and blessings, the bulk of the rites centre round the employment of the elf-arrow as the active element in the cure. The rationale of the rites is fairly clear, depending on the elementary rule of all magical reasoning that like affects like, the sympathetic belief which later gave rise to the Doctrine of Signatures. Casual connection in thought was analagous to causative connection in fact, hence it naturally followed that if an elf-arrow caused the disease, it could cure the disease. It was, therefore, tied to the diseased beast, rubbed over the beast or put into its drinking water.

The charm cures and amulets as we find them in the 19th century represent the remnants only of the larger body of early magical beliefs. Their continuance late into the 19th century was sanctioned by tradition and usage and, probably the most immediate reason, for good luck.

A Caesarian Section in the Second Millennium B.C.

A. LEO OPPENHEIM*

OF the large number of cuneiform tablets dealing with medicine in Mesopotamia, the historian of medicine can utilize only the small and relatively unimportant section which is available to him in adequate and up-to-date editions and translations. Most of that rich material is presented in a form that makes it unusable for the non-Assyriologist, that is, either in obsolete editions or in copies of cuneiform texts that are mostly in fragments. Quite a sizable number of texts are still unpublished. There exists no systematic study of Assyro-Babylonian medicine apart from a scanty few specialized articles written by Assyriologists, a certain number of outdated and inadequate summaries mostly written several decennia ago and, of course, the perpetual rehash of the popularizers, full of unwarranted statements and superficial generalizations.

A startling bit of information concerning a medical practice of the first half of the second millennium B.C. has been furnished recently by a legal text dealing with the adoption of a small boy. The text is dated to the 23d year of the well-known king, Hammurabi of Babylon, and was published by E. Szlechter in his book *Tablettes juridiques de la 1re dynastie de Babylone conservées au Musée d'Art et d'Histoire de Genève* (Paris, 1958) on pl. 9 and p. 3f. (MAH 15951). I have to thank Dr. E. Sollberger of the latter museum for a latex mold of the tablet from which a plaster of Paris replica was made and photographed in the laboratory of the Oriental Institute of the University of Chicago (see fig. 1).

The child to be adopted, two years of age, is described in this document by the hitherto not attested Akkadian expression *šilip rēmim* which means "pulled out (lit.: who was pulled out) from the womb." This could mean one of two things: that the child was delivered by means of the obstetrical forceps or that it was cut out of the womb of his dead or dying mother in an emergency operation. Against the first possibility militates the fact that the use of the forceps in successful deliveries is not attested even for the

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FIG. 1.

FIG. 2.

Fig. 3.

classical or early medieval periods in Europe. The caesarian section, however, performed on a dying or dead mother in order to save the child, is known to have been in use in very early times. At the stage of the development of obstetrics that one is allowed to presume for Mesopotamia in the second millennium B.C., forceps could have been used only at the cost of the child's life in a last effort to save the mother, and the caesarian section to save the child. Since the adopted child's mother evidently did not survive his birth, it is doubtful that the Akkadian words *šilip rēmim* can refer to anything other than a caesarian section.

Operations of that kind, typically performed on pregnant women who died for some reason before giving birth, are not unheard of in the history of primitive and early medicine. A passage in Justinian's *Corpus juris* (Digest 11, 8, 2) refers to the *lex regia* attributed to the legendary king of Rome, Numa Pompilius, that forbids the interment of a pregnant woman *"antequam partus ei excidatur"* before the offspring has been cut out of her. Greek mythology knows of two divine figures, Dionysios and Asclepius (see L. Edelstein, *Asclepius* 2, 36f.) who are said to have been born in this way, and there is the well-known passage in Pliny (*Nat. Hist.*, Book 7, § 47) that speaks of the name of Caesar as being derived from *caeso matris utero* "from his mother's cut womb." Pliny notes in this context that Caeso became a family name just as did Vopiscus (meaning "one of twins surviving after a premature birth"), which indicates that individuals born under such dramatic circumstances carried with them the memory of this event. This may explain why the adopted child of our text is expressly referred to as *šilip rēmim*.

Here is the transliteration and translation of the text. For the reading of the badly obliterated third line, I am indebted to Dr. B. Landsberger.

(1) *ṣú* (text *su-)-ḫa-ru-um ši-li-ip re-mi-im* (2) *1* DUMU *At-ka-al-ši-im* UG_x(BE) (3) TA ^{d}UTU-*na-ṣir* [ŠEŠ].GAL.[A].[N]I (4) *ù Ta-ri-iš-ma-tim* DAM (text NIN).A.NI (5) ^{m}SIG-*il-tum* DUMU EŠ-*ma-gir* (6) *a-na ma-ru-tim il-qí* (7) *1* GÍN KÙ.BABBAR *ù te-ni-q* MU.2.KAM (8) ŠE.BA Ì.BA SIG.BA ^{m}SIG-*il-tum* (9) *a-na* ^{d}UTU-*na-ṣir ù Ta-ri-iš-ma-tim* (10) *i-di-in ma-aḫ-ru* [*li-ib-ba-š*]*u-nu ṭà-ab* (11) ^{d}UTU-*na-ṣir ù Ta-ri-iš-*[*ma-tum*] (12) *ú-ul i-tu-ru-ma* (13) *ana* SIG-*il-tum ú-ul i-ra-ga-mu* (14) *lO ma-ri li-ir-ši-ma* (15) ^{m}DUMU-*Ištar-ma a-pil-šu ra-bu-um* (16) [M]U ^{d}UTU ^{d}*A-a* ^{d}AMAR.UD *ù Ḫa-am-mu-ra-bi* (17) IN.PÀ.DÈ.MEŠ Ibiq-iltum, the son of Sin-magir, adopted the male child, born through caesarian section [lit.: pulled out of the womb], the son of the deceased [woman] Atkalšim, from his [the

child's] oldest brother Šameš-nāṣir and his wife [text : sister] Tarīš-mātum. Ibiq-iltum handed over one shekel of silver and the nursing expenses for two years [consisting of] barley, oil and wool, to Šamaš-nāṣir and Tarīš-mātum. They have received them and are satisfied. Šamaš-nāṣir and Tarīš-mātum will not make other claims against Ibiq-iltum. Even if he [Ibiq-iltum—later on] has ten [more] sons, Mār-Ištar is to be his eldest and his heir. They [all] have taken the oath by the gods Šamaš and Aja and by [the king] Hammurabi [five witnesses and date].

This seems to be the situation that underlies the adoption recorded on our tablet: Atkalšim died either accidentally at the end of her gestation period or in labor, and a male child was cut out of her womb. The child must have been posthumous because it was reared by his oldest brother and a woman, Tarīš-mātum. The text calls her NIN, i.e., the sister of the child. This is unlikely for two reasons. It presupposes that the dead woman, Atkalšim, was already the mother of two children old enough to take care of their newborn brother and, two years later, to dispose of him legally; it presupposes furthermore that neither of them was married at the time their mother died, because it would have been natural for either of them to accept the orphan into their family. Once accepted, the child could only be given away jointly by his foster parents and not by his brother and his sister, not to speak of the difficulty of assuming that elder siblings were at all entitled to dispose of a younger one if he was orphaned. All these difficulties disappear when one assumes that the NIN "sister" of the text, has to be corrected into DAM, i.e. "wife" which presupposes only a minor scribal slip. Then Tarīš-mātum becomes the wife of the elder brother who reared—even suckled—the baby and therefore had every right to be mentioned in the adoption document beside her husband and was entitled to be compensated for the expenses incurred during the two years. It should also be noted that the child that is referred to in line 1 simply as *šilip rēmim*, is mentioned by name, Mār-Ištar, in line 15. This is extraordinary and should be taken to indicate that the child was given a name, or at least, an official or new name at the adoption.

In spite of minor difficulties[1] that worry only the philologist, the matter-of-fact way in which a document of that early date refers to a caesarian section makes this tablet a quite unique piece of evidence for the historian of medicine.

[1] Such as the spelling of *suḫārum* with *su-*, and the construction of the phrase *ana mārūtim leqûm* with TA instead of with the customary KI.

Notes and Events

Edited by Dorothy M. Schullian*

Harvey's "Boy abowt Holborn Bridg"

It has often been remarked that William Harvey's *Prelectiones anatomiae universalis* (1616), reproduced in autotype with a transcript by a committee of the Royal College of Physicians of London,[1] would be a rewarding field for a medical historian who combined the patience to penetrate Harvey's terse, agrammatical and unpunctuated mixture of Latin and English with wide knowledge of medical and physiological theory and the ability to interpret topical allusions to the contemporary scene.

The College committee which edited these lecture notes drew attention on page vi of the Introduction to the fact that they showed Harvey as "a daily devoted observer of everything that came before him," and they instanced among other examples that he "noted the odd development of a boy at Holborn bridge." This passage occurs on folio 10b where Harvey discussed hair as part of the skin and its appendages:

> . . . crescunt alienis locis
> the boy abowt Holborn bridg Beard in altera
> Bucca

Nearly 70 years later Sir John Charles in his Harveian Oration of 1955[2] referred to it again: "The Visceral lectures are a treasure-house indeed. . . . Individual cases are quoted—the boy about Holborn Bridge with a beard growing on one cheek only." But as Sir John rightly pointed out, "There is hardly a page without some flash of humour," and we wondered whether this passage was one of them. If translated as

> . . . [hairs] can grow in strange places
> the boy about Holborn Bridge with a beard on the other
> cheek

it would appear that Harvey was describing "a beard" growing "on the *other* cheek" similar to the one illustrated in the figure from a modern textbook. He had seen a hairy mole in a rare but well recognized site, a naevus pilosus now known often to be associated with another congenital anomaly spina bifida, of which it may be the only indication. This seems the more plausible interpretation since "a beard growing on one cheek only" does not correspond with any congenital condition or manifestation

* Cleveland, Ohio.

[1] J. & A. Churchill, 1886.

[2] The contrivance of collegiation. *Lancet*, 1955, 2, 987-993.

of disease, and what is more, Harvey specified that the "beard" belonged to a "boy."

It is open to speculation whether Harvey had any better acquaintance with the boy or how he came to see his buttocks. If, as is likely, he merely recorded a curiosity he had seen "abowt Holborn bridg" and had no chance of making a more detailed examination, he may well have passed by the opportunity of discovering what was later called spina bifida occulta. As it happened Nicolaas Tulp in 1641 first introduced the term spina bifida according to R. G. Fisher[3] although it had been observed by Hippocrates and the early Greek, Roman, and Arabian physicians as a condition in which at birth a soft or cystic tumor covered a gross bony defect of the lumbosacral spine. Rudolf Virchow in his remarks following a report by Dr. Bernhard Ornstein of a Greek soldier with lumbosacral trichosis described for the first time the post-mortem dissection of a hairy mole in this region which revealed a previously unsuspected spina bifida and for which he proposed the name spina bifida occulta.[4] In view of the recent centennial interest in Darwin's *Origin of Species* it should perhaps be added that Virchow, obviously with Darwin's *The Descent of Man* (1871) in mind, speculated to what extent a hairy mole in this region was a partial reversion to the condition of a tailed ancestry but thought that such cases should be studied carefully before deducing from them evidence for the descent of man from apes: "All I can say for certain about the origin of this most uncommon and surprising observation is that in this case at least one is not dealing with the formation of a tail in the sense of an atavism, but an eminently pathological condition. This growth of hair is only a hairy birthmark, a naevus pilosus, just as occurs on many other parts of the body. . . . It is due to a local irritation [in the developing foetus] which affects both the skin and the underlying parts."

However that may be, it seems that if our interpretation is correct, Harvey in his Lumleian Lectures, 1616, made the first observation of the superficial appearances of this condition in England.

RICHARD A. HUNTER
IDA MACALPINE

Second Annual Victor Robinson Lecture, Temple University

The Second Victor Robinson Lecture in the History of Medicine at Temple University School of Medicine was given by Dr. Richard H. Shryock on 11 May 1960. His topic was "The Role of History in Medical Education." This lectureship was initiated in 1958 as a memorial to Dr. Robinson, who held the appointment of Professor of the History of Medicine at Temple University from 1929 until his death in 1947. The First Lecture

[3] Surgery of the congenital anomalies. In: *A history of neurological surgery*. A. E. Walker, Ed. London, Baillière, Tindall & Cox, 1951, pp. 351 ff.

[4] *Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte*, 1875, pp. 279-281. In: *Zeitschrift für Ethnologie*, 1875, 7.

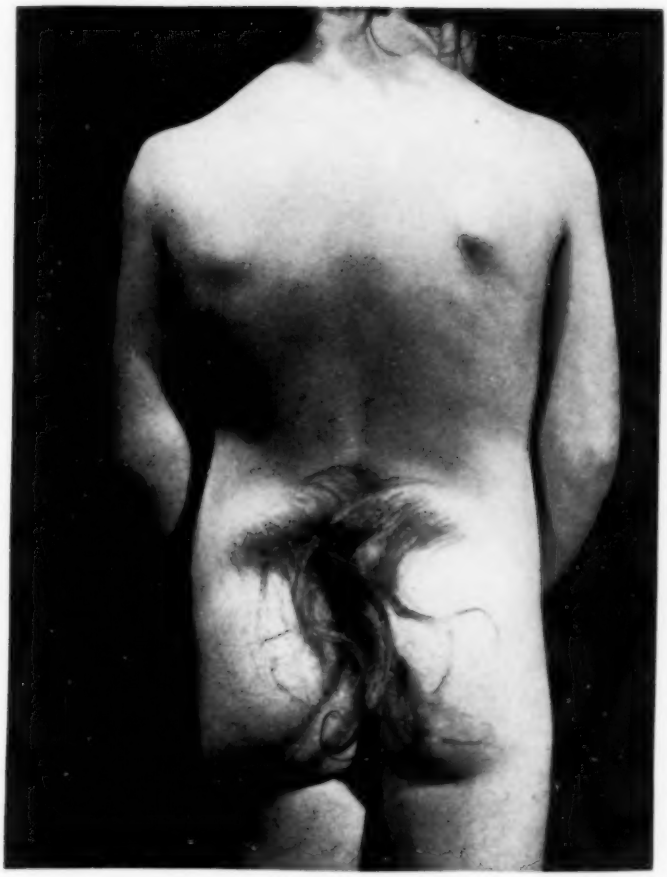
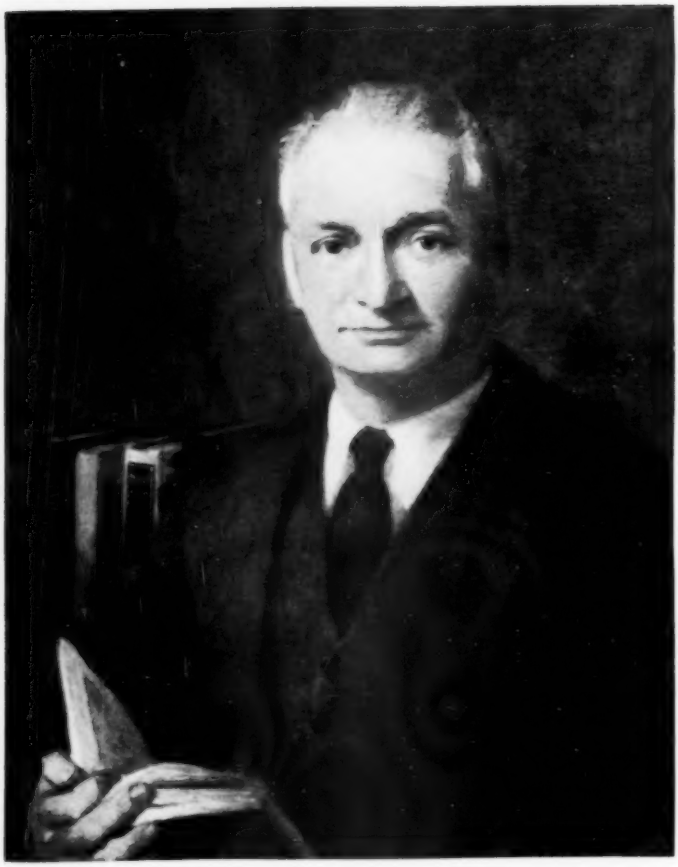


FIG. 1. Illustration of abnormal hair growth in the lumbar region associated with spina bifida occulta in a four-year-old patient, from *Neurosurgery of Infancy and Childhood* by Franc D. Ingraham and Donald D. Matson, Springfield, Ill., Charles C Thomas, 1954, p. 61. Reproduced by kind permission of Franc D. Ingraham and the publisher.



Portrait of Victor Robinson 1886-1947

(Journal, 1958, *13,* 423 and *International Record of Medicine,* 1959, *172,* 89-100) was delivered by Dr. George Rosen, who, like Dr. Shryock, was a friend of Dr. Robinson.

On the same program a portrait of Dr. Robinson (see plate), gift of his mother, Mrs. Marie Robinson, and his sister, Mrs. Ellen H. Ringer, was presented to the School of Medicine. It will hang in the Library there. The painter is Mr. Neil Kosh, Instructor in Portraiture at Temple University's Tyler School of Fine Arts. Dean Robert M. Bucher and Dr. Fred B. Rogers of the School of Medicine spoke briefly at the presentation. Several of Dr. Robinson's books *(The Story of Medicine, Pathfinders in Medicine, White Caps,* and *Victory over Pain)* appear in the background of the portrait.

Eli Ives and the Medical Use of Ether Prior to 1846

The use of ether prior to 1846 by lay persons in the form of "ether frolics" is well known. That ether was also employed therapeutically by respected physicians for medicinal purposes prior to its use as an anesthetic is not, however, as generally appreciated. In the process of reviewing lecture notes written by students in the earliest classes of Yale Medical School, the following interesting account was found regarding the medicinal uses of ether.

All of the lecture notes reviewed (six in number, extending from 1813 to 1828) were taken during lectures on Materia Medica delivered by Professor Eli Ives. Ives, born in New Haven in 1779, was graduated from Yale College in 1799 and, as the second generation in a family which was to produce five generations of physicians, he began the study of medicine in New Haven under his father and Eneas Munson. His medical education also included trips to Philadelphia where he attended lectures by Rush, Wistar, and Barton. In 1802 he started practising medicine in New Haven and apparently soon became highly regarded locally, being awarded an honorary degree of Doctor of Medicine by the Connecticut State Medical Society in 1811. In 1813 he was appointed as the first Professor of Materia Medica and Botany in what was then known as the Medical Institution of Yale College. He remained in this position until 1829 when, following the death of his friend Nathan Smith, he was appointed to succeed Smith as Professor of Theory and Practice of Medicine. He retired from this post in 1852 but continued an influential figure in medicine, being elected President of the American Medical Association in 1860, the year before his death.

Judging by the notes taken by his students, the format of Dr. Ives' lectures to medical students remained remarkably constant from 1813 to 1828. The students assiduously copied down everything he said, and he said almost the same thing each year for the entire period of 15 years. Even the jokes were the same! This reflection on the slow progress made in therapeutics during this era is equalled in interest only by the consistency

with which Ives advocates ether as a valuable therapeutic agent. This is best exemplified by quoting directly from the notes taken by one Elijah W. Carpenter during the academic year 1813-1814. The notes of the other five students reviewed are, as mentioned, almost identical. In each instance the students have as a major topic "Narcotics," and in each set of notes the first narcotic discussed is ether. To quote from Carpenter:

Ether is of four kinds, viz. Sulphuric, Nitric, Acetous, & Muriatic. This substance is obtained by the action of *Acids* on Alcohol; it resembles alcohol in chemical properties, except that it contains more Hydrogen. The different Ethers vary in composition & properties as they are obtained from different acids. Ether is the most volatile and light fluid with which we are acquainted; it is very inflamable, its smell is fragrant, taste pungent, and to most people agreeable.

Sulphuric Ether is a Stimulant whose action on the system is not succeeded by indirect Debility. This is a conclusion which I have drawn from a variety of experiments on others & myself. Ether has been considered as an anodyne; it may be so indirectly, as it relieves pain & spasm, and equalizes the action of the system; this last effect is produced by its diaphoretic powers. Ether is the most diffusible stimulant we possess; its effects are perceived instantly to the ends of the fingers and toes. A glowing sensation is first felt in the stomach. The same is extended to the extremities.

In most Spasmodic Diseases, Flatulence, Dyspepsia, Asthma, and generally for Pneumonic affections accompanied with spasm, it is used with advantage. Also in *Chronic Cough,* and is a good expectorant by itself, or combined with mucilage or amonia. Ether may be used *pure,* or diluted with alcohol; in the last form it is called Spt. Vit. Dulcis. The portions are Ether ʒj Alcohol ʒij. This is Hoffman's Anodyne Liquor. Spt. Vit. combines readily with water in any proportion, and may be stronger or weaker, to answer the intention of the prescriber.

Ether does not readily combine with water. In *Typhoid Fevers,* diluted Ether is given to keep up the action of the system, and produce perspiration. It may [be] given also in flatulence of the stomach and lymphanitic state of the bowels attending *typhus,* and in last stages of this disease, it may be given mixed with *wine* or diluted *alcohol,* and adds much to their virtues. It seems to qualify *wine* or *alcohol,* as aromatics do *Tonics.* Doct. Rush never suffered a patient to die of typhus fever, without taking a teaspoonful of Ether every hour.

Ether stimulates the skin by external application, if the ether is confined to the part by the hand, or in any other manner, it increases the heat of the part, but if suffered to evaporate, it diminishes the temperature of the part, by conveying off the Caloric in a latent state.

In *Strangulated Hernia,* Ether has been used successfully; it diminishes, by evaporation, the volume of the scrotum—it acts as an antispasmodic and stimulates to action the Absorbents of the part. *Two* or *three* ounces of Sulph. Ether may be poured on the scrotum and parts adjacent, a little at a time. I have often used *Ether* in my practice, in cases of *Strangulated Hernia,* & would recommend its use in every case of this kind, when there is not contraindications. Other remedies are large Bleeding, Opium, warm fomentations, injections of *warm water,* or warm Catnip Tea, are used, as sometimes tobacco injections.

For *Local Debility* of the *Stomach,* and indigestion, *Ether Vit.* is one of the best remedies which I have used. I usually combine it with Huxham's *Tinct.* of the Bark, or Spirit of Lavender. Rx Comp.: To Huxham's Tinct., ℥j I usually add of Ether ʒij Dose, a Tablespoonful 3 or 4 times in a day in *wine* or other liquids.

In *Cramp* of the *Stomach,* it is useful, also in chronic Debility arising from any cause. For *faintness* it is a paliative taken internally. In *Pains* of the *head,* Ether is very useful whether the pains arise from *Nervous irritation,* or *Congestion.* If the pain is from spasm or nervous irritation, the *Ether* when applied to the head should be covered to prevent evaporation. If from Congestion or inflammation, evaporation should be promoted.

In *Torpid States* of the *kidney,* I have used with advantage *Ether* & Spt. Tereb. āā gtt. 15.

In *Consumption* the last stages, and in Pneumonia, the difficulty of breathing is relieved by inhaling the vapor of *Ether.*

In *Suffocating Catarrh* Ether should be used freely; it may be given in Teaspoonful doses combined with mucilage. It may be inhaled in form of vapor or ʒj of it, mixed with ℥j of *syrup* of *sugar,* Dose, Tablespoonful; this is a very good expectorant in spasmodic cough accompanied with Dyspepsia: —The expectorant qualities of the *Elixir Asthmatic* by the addition of Ether in proportion of ʒij of the *Ether* to ℥j of the *Elixir.*

In *fevers* of a Malignant Pneumonic form, Ether is useful combined with Aqua Ammonia. Also as an external application to burns. I recollect a case of a Mr. Higgins who suffered *extremely,* from cutting peppers for some time, but he was relieved by the application of Ether to the parts which had been exposed to action of the peppers.

It is evident from the preceding that Ives, as well as others, regarded ether as an agent with many valuable properties. One of these was its ability to relieve pain and spasm, and for this purpose Ives advocated its use not only by topical application, but also by oral ingestion and by inhalation. The analgesic effect of the topical use of ether was undoubtedly, as Ives suggests, due to its ability to produce local hypothermia during evaporation. It is apparent, however, that Ives was not aware that ether was having any significant effect on the brain or on the perception of or reaction to pain when it was ingested or inhaled. When administered orally or by inhalation, as in cases of typhus, it was apparently given as a narcotic as often as a tonic. Even when applied to the head for the relief of pain, the general analgesic effect of ether was not realized even though ether vapor was in all probability inhaled in amounts sufficient to produce an effect on the central nervous system. The true anesthetic properties were to remain unrecognized until Long's use of it for this purpose in 1842, and until Morton's introduction of ether anesthesia to the medical profession in 1846.

NICHOLAS M. GREENE

Heberden's Description of Angina Pectoris: Errors in the Literature

The history of the description of angina pectoris is well documented. The first comprehensive discussion of the disease was in a report read by William Heberden, Sr., before the College of Physicians in London on 21 July 1768. This appeared in the *Medical Transactions, Published by the College of Physicians in London,* 1772, 2, pages 59-67, under the title "Some Account of a Disorder of the Breast." Heberden called this disorder "angina pectoris," and 20 cases are mentioned in the report. A second edition of the same volume of the *Medical Transactions* was published in 1786. The title, pagination, and content are identical with the first edition. In his *Commentarii de morborum historia et curatione,* published posthumously by his son, William Heberden, Jr., in 1802, the description of angina pectoris is presented under the title "Pectoris dolor" and was based on 100 cases. In the same year there appeared an English translation of the *Commentaries.* The manuscript of the *Commentarii* was dated August 1782 but at Heberden's request was not to be published until after his death.

This history of the description of angina pectoris is readily verified, but numerous errors are recorded in the literature. The majority are concerned with the title of the *Transactions.* They are often referred to[1-6] as the *Medical Transactions* of the *Royal* College of Physicians. We are unable to ascertain why, when the *Medical Transactions* were published, the College of Physicians was not referred to on the title-page as the *Royal* College of Physicians. The term *Royal* was used in a publication as early as 1677.[7] Mr. L. M. Payne, the current Assistant Librarian of the Royal College of Physicians, informs us that "The history of the use of the word *Royal* in the title of the College is somewhat obscure and it seems unlikely that the matter will be cleared up until a full history of the College has been written."[8]

Another commonly made error would have the *Transactions* published by the College of Physicians *of* London, not *in* London.[1] Again, the date of the second edition of Volume 2, 1786, has apparently been confused with the date of the first edition, 1772, since the information that it is the second edition is not provided.[9] Heberden first presented his paper in 1768 at a meeting of the College. Garrison says[10] merely that "Heberden describes angina pectoris" in 1768, but some actually use the presentation date as the publication date.[11,12] Confusion has also arisen[13,14] regarding the date and circumstances of the *Commentarii.*

There are other miscellaneous errors in the literature. Garrison[15] states that Heberden by 1801 had seen 100 cases. This year should be 1782, the date of the manuscript of the *Commentarii.* Willius and Dry[16] state: "In this work [*Commentaries on the History and Cure of Diseases*] Heberden recorded, described and named the clinical syndrome which has since that time been known as 'angina pectoris' or as he expressed it, 'Pectoris dolor'

(1772)." The date 1772 is for the *Transactions,* but the term "pectoris dolor" first appeared in the *Commentarii,* not in the *Transactions.*

MORRIS M. WEISS, SR.
MORRIS M. WEISS, JR.

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Beneficence in New Zealand

The New Zealand Herald for 17 February 1960 brings welcome news to the medical library world that Sir Ernest Davis, the New Zealand philanthropist, on the eve of his 88th birthday has set aside as an outright gift a sum adequate for the erection of a new medical library in Auckland and with it has donated an initial sum of £5000 for the purchase of books, to be followed by £500 each year for ten years to keep the library up to date. In his deed of gift, Sir Ernest records a state of affairs all too familiar to medical schools elsewhere in the world even today when he says, "I have been told that the nucleus of a medical library at present housed in the only space available—a basement at Auckland Hospital—has meant much to doctors in keeping them in touch with the latest developments in medicine and surgery and in encouraging research. I have also been told that the library suitably augmented in a properly designed building would mean very much more." The building actually envisioned is in fact a modest one with an area of 3,500 square feet and shelf space for 20,000 volumes, together with committee room, offices and workroom, and a lecture hall planned to seat 120 persons. One could wish, however, that the building had a somewhat larger capacity against future growth.

The moving spirit behind this salutary development is the eminent surgeon, Dr. Douglas Robb, CCHM, FRCS, who has been named President

of the British Medical Association for its Auckland meeting in 1961. Among other things Dr. Robb proposes establishment of a group to be known as the "Friends of the Auckland Medical Library," thus following a pattern that has done so much to enlist assistance for libraries, medical and otherwise, throughout the world.

J. F. F.

Theodore George Harwood Drake, O.B.E., 1891-1959

Dr. Theodore Drake, who died in Toronto on 28 October 1959, has left a fine history of dedication to the study of the well-being of children that for many years to come will be difficult to equal. Not only was he an authority on baby care, but an outstanding historian on all the aspects of the progress and the teaching of paediatrics from antiquity to the present day. As a collector of everything pertaining to his specialty he left a museum of well-documented artifacts, books, and children's furniture that I doubt can be equalled anywhere in the world.

Dr. Drake was born in Webbwood, a town between Sudbury and Sault Ste. Marie, and was graduated from the University of Toronto in 1914. He interned in the Toronto General Hospital and served in the Royal Army Medical Corps in World War I. On his return from military service he practised in Caron, Saskatchewan, for four years, after which he started his special training in paediatrics in The Toronto Hospital for Sick Children, proceeding from there to further work in Boston and Europe. In the Research Department of the Sick Children's Hospital, he was one of three doctors on that staff who originated Pablum. His knowledge of food values, and in particular his responsibility for determining minimal effective food levels for the dietary of prisoners of war and of the Royal Canadian Air Force, won him the Order of the British Empire. He became Associate Professor of Paediatrics in Toronto, serving in that capacity until he retired seven years ago; even after retirement he kept in close contact with his chosen field until the state of his health forced him to withdraw two years ago.

A quiet, self-effacing man, he was revered as a teacher not only by students but by countless graduates who wished to further their knowledge in this field. He carried out many research studies and published numerous papers, largely on nutrition, thus adding greatly to knowledge of rickets, scurvy, and the value of ultra-violet therapy. His work as a member and chairman of the Academy of Medicine Museum Committee contributed much to strengthening that unique collection, and his wise counsel will long be missed by those of us who now will carry the collection forward. He was a member of The Canadian Paediatric Society, The American Academy of Paediatrics, and The American Institute of Nutrition, to list but a few of his affiliations.

Dr. Drake had definite ideas of his own, but being reserved and soft-spoken he never forced his opinions on anyone and was always willing to listen to others, even if he could not agree with them. In spite of his extraordinary attainments, he lived a retiring life but showed genuine pleasure in anyone who shared his interests and was ever ready to display his treasures. His funeral was private, in keeping to the end with the general tenor of his life.

HAROLD D. BALL

Juan B. Lastres y Quiñones, 1902-1960

Dr. Lastres was born in Chiclayo, in northern Perú, and embarked on his professional practice of neuropsychiatry when he was in the Peruvian Army as head of the psychiatric service in the Medical Corps. He afterwards retained his interest in this specialized field in his private practice. Some of his historical works concern such great Peruvian neurological patients as Lope de Aguirre, and other professional publications deal with the question of neurobartonellosis. Lastres' magnum opus was the three-volume History of Medicine in Perú, which was published in 1955, on occasion of the fourth centennial of the University of San Marcos. This work enables the reader to realize and appreciate Lastres' profound knowledge of every phase in the history of Peruvian medicine—that of the pre-Inca, Spanish colonial influences, and finally the developments which took place since Perú achieved her independence. Lastres had previously afforded glimpses of his learning in his studies on the Codex of Guaman Poma de Ayala, on smallpox during Colonial times, and in his biography of Hipolito Unánue, the father of Peruvian medicine.

In 1957 we went together to study some archaeological "huacos" at the Museum of La Magdalena at Lima and discussed the fine examples of Nazca and Chimú pottery. On the same visit Lastres took me to the ancient fortress of El Callao and there displayed his knowledge of military strategy in a brilliant discourse on the tactics employed by a small Spanish force which had managed to hold out in the fortress for two long years during the War of Independence but finally capitulated. Afterwards we went to his office in the University of San Marcos, where he showed me the research he was at that time engaged in—the life of Unánue.

Lastres was the leading authority on the history of medicine in Perú; his work had in many respects superseded that carried out by Valdiá in the previous generation, and it is even more deserving of recognition because he had been able to put out a considerable number of monographs, books, and papers almost without any support.

It is to be regretted that Professor Lastres never visited the United States and that American scholars rarely had the opportunity to meet this man who was one of the most distinguished figures in the history of medicine in Latin America.

F. GUERRA

International Meetings

The Seventeenth International Congress of the History of Medicine will be held 4-14 September 1960 at Athens and Cos. An announcement from the President of the International Society of the History of Medicine, Dr. Ernest Wickersheimer, states that the Honorary President will be Aristote P. Couzis, the President N. Oeconomos; topics to be discussed are Hippocrates and his School, the School of Alexandria, and Byzantine Medicine. Details of the arrangements may be procured from the Secretary General of the Society, Dr. F. A. Sondervorst, 124 Avenue des Alliés, Louvain, Belgium. In its emphasis on Greek medicine the Congress was anticipated by the Garrison Lecturer for 1960 of the American Association for the History of Medicine, Dr. Ludwig Edelstein, who at Charleston on 24 March examined "The Distinctive Hellenism of Greek Medicine."

The Tenth International Congress of the History of Science will be held in the United States 26 August–2 September 1962. The opening sessions will take place at Cornell University, Ithaca, New York, the concluding sessions at the American Philosophical Society, Philadelphia, Pennsylvania. The President of the Congress is Prof. Henry Guerlac, the Secretary Prof. C. Doris Hellman. All inquiries should be addressed to The Secretary, Tenth International Congress of the History of Science, Cornell University, Ithaca, New York.

Historical Gleanings

The Tenth Clendening Lecturer on the History and Philosophy of Medicine was J. B. de C. M. Saunders, Dean of the University of California School of Medicine. The lecture, delivered on 21 March at the University of Kansas Medical Center, was entitled "The Transitions from Ancient Egyptian to Greek Medicine."

On 14 April, at the Fifty-Sixth Annual Meeting of the Classical Association of the Middle West and South, Inc., in Athens, Georgia, L. R. Lind presented a paper entitled "Popular Knowledge of Anatomy and Medicine in Greece before Hippocrates."

In a debate at the Oxford Union Society on 3 December 1959 it was the task of Prime Minister Harold Macmillan to argue the Hippocratic and also characteristically Oxonian question "Vita brevis, ars longa." Contending that no one really knows the meaning of the aphorism, he lapsed into reminiscences of his early days at Oxford 45 years ago and into the history of the Union, which began in 1823 when free disputation did not enjoy the whole-hearted approval of the university. His team was defeated in the debate. On 30 April Mr. Macmillan was installed as Chancellor of the University of Oxford in a solemn ceremony conducted in the Latin language. His own Latin faltered because, as he said, he had not used it since his undergraduate days.

Augusto Beccaria continues the work in mediaeval manuscripts which has already proved so helpful to medical and other historians who consult his catalogue *I codici di medicina del periodo presalernitano* (see Journal, 1958, *13*, 106-109). This covered the 9th, 10th, and 11th centuries; not only is he in process of extending it for the 12th century, but he has in addition begun the publication of studies on the early Latin translations of Hippocrates and Galen. Their general title is "Sulle tracce di un antico canone latino di Ippocrate e di Galeno," and the first one appeared in *Italia medioevale e umanistica*, 1959, 2, 1-56. It examines in particular the evidence offered by the Ambrosian manuscript G.108 Inf. and by Parisinus latinus 7027, both of the 9th century, for the following works: *Prognosticon, De septimanis, De aere aquis et locis, De salubri diaeta, De victus ratione,* and the *Liber ad Mecenatem* or *De natura generis humani*. In the tradition Ravenna played a notable part.

The *American Journal of Archaeology*, 1960, *64*, 78-83 and Plates 19-20, carries a report by Erik Sjöqvist of Princeton University on the Hellenistic medicine bottles, 54 in number, which were uncovered in excavations of 1955-1959 at Morgantina in Sicily. Some were for purely practical use, others of symbolic value and votive purpose; they date from the 3d century B.C. to possibly the 2d quarter of the 2d century. A number of them are stamped with the word lykion, a drug described by Dioscorides and other authors, including Sir James Young Simpson, and one of the few Greek and Roman drugs which have no ancestry in Pharaonic Egypt. Seven of the bottles are inscribed with a seal rendering the head of Asklepios. Professor Sjöqvist in two footnotes expresses his indebtedness to Chauncey D. Leake for assistance in matters pharmaceutical.

A brochure of importance for Dioscorides was issued in Padua in 1959. It combines Elpidio Mioni's article "Un ignoto Dioscoride miniato" as published in the volume *Libri e stampatori in Padova. Miscellanea di studi storici in onore di Mons. G. Bellini* (Padova, 1959), 345-376 with the magnificently colored plates, with briefer text, which he published by courtesy of Lepetit S. p. A. under the title "Un nuovo erbario greco di Dioscoride" in *Rassegna medica:* "Convivium sanitatis," 1959, *36*, 169-184. The manuscript concerned is Codice greco 194 of the Biblioteca del Seminario at Padua; it was written at Constantinople certainly between 1339 and 1406 and probably about 1350. Prof. Mioni examines, with careful and abundant documentation, the history of the manuscript, its relations with other manuscripts of Dioscorides, and its content. Written on 200 paper folios and lacking some folios at beginning and middle and end, it contains in two alphabetical series 467 miniatures of plants, full-page ordinarily in the first series and two to a page in the second. It is worn from use, and its margins show traces of dampness which fortunately did not reach the miniatures.

Readers wishing to learn more of Christina, recluse and later prioress of Markyate, whose hemiplegia was discussed by Charles H. Talbot in the Journal, 1958, *13*, 254-256, may now turn to his full edition and translation of the Cottonian manuscript which recounts her career. Written in the 12th century by a monk of St. Albans, the manuscript was badly damaged in a disastrous fire in 1731 but has been carefully deciphered with the aid of ultra-violet ray photographs. It was published under the title *The Life of Christina of Markyate* (Clarendon Press, Oxford University Press, 1959, 193 pp.).

With the support of 11 Latin and French documents in the Public Record Office Professor G. E. Trease of the Department of Pharmacy, The University, Nottingham, has identified and placed in the setting of their period and their activity several spicers and apothecaries who in the 13th and early 14th centuries supplied the royal households of Henry III, Edward I, and Edward II. His investigations are published in *Nottingham Mediaeval Studies*, 1959, *3*, 19-52. Partly because most of the medicinal remedies of the Anglo-Saxons consisted of indigenous drugs, the preparation of which did not require any large amount of pharmaceutical knowledge, it is unlikely that the office of royal apothecary existed before the 13th century. But as electuaries compounded of imported drugs came into use, the mediaeval apothecary began to appear especially in the urban communities. He was at first a spicer-apothecary, and the early royal apothecaries were often men of substance, actively engaged in commerce, who were summoned in times of illness or for the preparation of spiced wines for festivals and who probably had at court also nonpharmaceutical duties. Such representatives as Joseph the Spicer, Robert Montpellier, Peter de Paris, and Odinet the Apothecary emerge; at least two sons of Robert Montpellier continued the father's activities. Professor Trease's narrative is strengthened by abundant references to other sources and to the literature. In Appendix I he furnishes the complete text of the 11 documents, a device which one wishes could be employed more widely in learned journals, and in Appendix II an alphabetical list, with explanation, of the commodities mentioned.

More than one historian of medicine has found himself concerned at one time or another with that almost universal genius Nicolaus Cusanus, who in the 15th century shone so brightly in many fields of learning. A definitive edition of his works began to appear in 1932 under the auspices of the Heidelberger Akademie der Wissenschaften, and by 1940 six volumes had been issued. An announcement in *Publishers' Weekly* for 7 March 1960 carries the welcome news that publication has now been resumed and that the 10 volumes still due will appear at the rate of two a year. Details of the project can be procured from Felix Meiner Verlag, Hochallee 60, Hamburg 13, Germany.

With a salute to George L. Hendrickson for his article of 1934 which is "unique in Fracastorian criticism by virtue of the number of errors it explodes and the light it sheds on the development of the poem," Richard T. Bruère contributes "Observations on the Third Book of Fracastoro's *Syphilis*" to *Studies in Honor of Ullman* (Saint Louis, Saint Louis University, The Classical Bulletin, 1960, pp. 104-117). He would differ with Hendrickson, however, for to him "verses 3.265-287 are not vestiges of a discarded draft, but an essential and basic part of the book, whereas the conflicting Syphilus story is a late and somewhat perfunctorily inserted addition." In setting forth the evidence for this conclusion and inquiring into Fracastoro's reasons for thus augmenting his poem, he maintains that the word "syphilis" was not, at the time Fracastoro wrote, a synonym of *morbus Gallicus* which would be readily understood by contemporary readers. His final paragraph should send at once to the article itself all those desirous of studying further this complicated and important chapter in the history of medicine: "It is a curiosity of literary and linguistic history that the episode which introduced the name that was to become the universal designation for the great disease was a negligent, almost fortuitous, addition to Fracastoro's poem, and the name itself in origin a *vox nihili*."

The publication *Strenna storica bolognese (Anno nono)*, Bologna, 1959, carries on pages 149-154 an account by Gherardo Forni of the honorary inscriptions in the Archiginnasio to Giovanni Antonio Godi, who was graduated in philosophy and medicine in 1619, and to Antonio Maria Valsalva (1666-1723). Both taught for long years in the Studio of Bologna. The decoration of the arch in which the inscriptions are set suffered damage during World War II but has now been restored.

An authoritative report by Peter Laslett in *The Times Literary Supplement* for 11 March acclaims Mr. Paul Mellon's recent gift to the Bodleian Library of 11 manuscript volumes of John Locke. Some 835 printed books will follow. This magnificent gift, be it noted, "comes from an American collector who is not an Oxford man and who has had no previous interest in the books and papers of John Locke. Such extraordinary generosity cannot go unnoticed by scholars and by libraries all over the English-speaking world." It is indeed fortunate that these items will eventually be assembled in the library of Locke's own university to join the massive collection of his papers already there; this is patronage in its finest sense. Included are a notebook on medicine and the two volumes of the Herbarium, a collection of some 3,000 plants which Locke picked in Oxford when he was studying medicine. The printed volumes, which are marked in Locke's characteristic fashion (Journal, 1958, *13*, 418-419), will be retained by Mr. Mellon during his lifetime. An editorial in the same issue of *The Times Literary Supplement* terms the collection of books and manuscripts "comparable only (and perhaps at no disadvantage) with Isaac Newton's library at Trinity College, Cambridge." It needs to be added

here that Peter Laslett in his report modestly neglects to mention his own very significant role in all this matter.

"The Case of the Dangerous Doctor," which is Chapter I, pages 9-23, in the book by John Bakeless entitled *Turncoats, Traitors and Heroes* (Philadelphia & New York, J. B. Lippincott Company, 1959) relates in lively fashion the melancholy story of Dr. Benjamin Church, who in 1775 was appointed Director General and Chief Physician of the Army Medical Department and was later arrested for treason, was exiled to the West Indies in 1780, and was presumably lost at sea during the voyage there.

In *The Annual Report of the Library Company of Philadelphia for the Year 1959* (Philadelphia, 1960) Edwin Wolf 2nd, Librarian, touches delightfully on several matters of interest to medical historians—on the apothecary Tobias Hirte, who in the 1790s sold Indian-French-Creek-Seneca-Spring-Oil in Philadelphia to cure a variety of ailments and in 1910 was awarded a place in the prefatory poem of Rudyard Kipling's *Rewards and Fairies;* on the piety and superstition of Pennsylvania-Germans which created a flourishing market for folk medicines and home remedies and for such collections of cures and advice as the *Kurzgefasstes Arzney-Büchlein* and the *Kurzgefasstes Weiber-Büchlein;* on Girolamo Ruscelli's *Secrets of the reverende Maister Alexis of Piemount;* on that humorous and satirical piece, *The Honour of the Gout,* which was published by Benjamin Franklin; on the ledgers and receipt books of Benjamin Rush; and on Dr. James Graham, a Scot who studied medicine at Edinburgh and in 1771 and 1772 advertised in the *Pennsylvania Packet* his cures of disorders of the eye and ear. Graham is better known for his subsequent notorious career in England, where his Temple of Health, provided with electrical, magnetical, aerial, aetherial, and musical influences, enjoyed great success. Dr. Richard A. Hunter recently presented to the Library Company a copy of Graham's *Guardian Goddess of Health: or the Whole Art of Preventing and Curing Diseases; and of Enjoying Peace and Happiness of Body and Mind* (London, ca. 1780).

The centenary in 1959 of the death of Alexander von Humboldt was marked by Heinrich Schipperges through publication of "Alexander von Humboldt und die Medizin seiner Zeit," in *Archiv für Kulturgeschichte,* 1959, *41,* 166-182. This was delivered as an inaugural lecture on 21 February 1959 at the University of Bonn, where on 6 September 1828 the degree of "Doctor medicinae honoris causa" was conferred upon Humboldt in recognition of his services to physiology and pathology.

The paper by Jo Ann Carrigan which won the Hammond Prize as the best graduate essay submitted to the board of editors of Phi Alpha Theta, National Honor Society in History, in 1959 has been published in *The Historian,* 1959, 22, 64-88. Entitled "Some Medical Remedies of the Early Nineteenth Century," it is based on a manuscript, now in the possession

of the essayist, which found its way in the 1850s from North Carolina to Arkansas in the baggage of a pioneer family. The manuscript was probably compiled by a wealthy planter in the first half of the 19th century when planters commonly practised medicine among their families and slaves. Diseases and ailments, with their remedies, are listed alphabetically under the categories Man, Horses, Cows, Sheep, and Chickens. The compiler was familiar with medicine and pharmacy but was not himself a physician.

Publications honoring Darwin continue to appear after the anniversary year of 1959. Surely one of the most attractive is Bern Dibner's *Darwin of the Beagle* (Norwalk, Connecticut, Burndy Library, 1960, 72 pp., 2 ll.), which recounts the famous voyage in a text made the more vivid by the illustrations with which it is provided. Pages 49-60 are devoted to Darwin's later work; bound in at page 47 is a facsimile of one manuscript sheet from *The Origin of Species,* and following page 61 the Darwin-Wallace papers are printed as they appeared in the *Journal of the Proceedings of the Linnean Society* for 20 August 1858. A two-page bibliography and an illustration of the Beagle from a model completed in 1959 by Mrs. Lois Darling are provided at the end. Historians will also find of unusual interest the paper by Raymond L. Brett, Professor of English at the University of Hull, entitled "The Influence of Darwin upon his Contemporaries" (*The South Atlantic Quarterly,* 1960, *59,* 69-81). This shows that it was the writings of Leslie Stephen, George Henry Lewes, and John Morley in the periodicals of the time which popularized Darwin's work, championed his theory of evolution, and set the scene for poets and artists.

For the centennial year of the birth of the mathematician Florian Cajori, who in both scholarship and teaching brought unusual prestige to Colorado College and whose eminence in the fields of education and the history of science was international, the college sponsored on 25 February 1959 a public lecture by Oystein Ore entitled "Pascal and the Invention of Probability Theory." In this fascinating demonstration, published in *The Colorado College Studies,* Spring, 1959, no. 3, 11-24, Professor Ore argued convincingly against the common assumption that probability theory was initiated when in 1654 a gambler named de Méré proposed to Blaise Pascal "two problems which he had run across in his experiences at the gaming table." Antoine de Gombaud, chevalier de Méré, sieur de Baussay, was indeed the first to call Pascal's attention to the dice problem, which queries how many throws a person playing with two dice must be allowed to have a better than even chance of getting two sixes at least once, and the division problem, which queries how the prize money in a tournament shall be divided equitably in case the series is for some reason interrupted before it is completed. Both problems were ancient and well-known questions, and it is quite unlikely that they were based upon de Méré's personal

gambling experiences. In the course of the demonstration the reader meets also other mathematicians of the 17th century who were engaged on such problems—Gilles de Roberval, Pierre de Fermat, Pierre de Carcavy, and Christiaan Huygens. In the still valid judgment of Leibniz, "So also the games in themselves merit to be studied and, if some penetrating mathematician meditated upon them, he would find many important results, for man has never shown more ingenuity than in his plays." On pages 5-9 of the same journal Raymond Clare Archibald contributes a centenary appreciation of Cajori which is condensed from *Isis*, 1932, *17*, 384-407; a bibliography of his principal works, running to more than 60 items, is provided.

In *The Alabama Review*, 1960, *13*, 21-39 Robert Partin examines the contributions in the fight against yellow fever which were made by Dr. Jerome Cochran (1831-1896). Dr. Cochran is well known to historians for his leadership in founding the Alabama Medical Association and the Alabama State Department of Health; he was also in his time a yellow fever expert of international reputation, but the victory achieved over the disease in the decade immediately following his death overshadowed his work. He saw his first case in Memphis in 1855.

In the old Ozarks "granny-woman" was the popular name for midwife. She rendered valuable assistance on countless occasions but seldom stopped to combat the superstitions which surrounded childbirth, and even today a sharp ax is sometimes placed under the bed to make a difficult birth easier. Belief in the marking of offspring from shock or fright during pregnancy was common. "Lizzie's third youngen," for example, "was pop-eyed and didn't have good sense . . . 'cause Lizzie stepped on a toad-frog about three months 'fore the youngen was born. I give it onion tea to help it break out with the rash, wrapped it in a blanket, and done ever'thing I knowed to do, but hit didn't help matters." Additional superstitions are listed by Otto Ernest Rayburn in *Midwest Folklore*, 1959, *9*, 145-148.

The extraordinary career of James J. Walsh (1865-1942) is carefully traced by Harry W. Kirwin in *The Catholic Historical Review*, 1960, *45*, 409-435. This paper was originally delivered as the presidential address at the 40th annual meeting of the American Catholic Historical Association in Chicago on 29 December 1959. It sets down *inter alia* the relations of Walsh with Rudolf Virchow, with the Fordham Medical School, and with Fielding Hudson Garrison.

Some of the manifold uses of *djamu* are recorded by Louis Fischer in *The Story of Indonesia* (New York, Harper & Brothers, 1959), 199-205. This native medicine, which is dispensed by *dukuns* or medicine men, is made from bark, leaves, grasses, herbs, buds, and roots in a variety of forms. It may come as a powder, for example, in paper packets, or it may take the shape of beans, peas, flat buttons, or marbles. In whatever form it is dispensed it is thought to carry a mystic power to heal or strengthen.

Both the Special Libraries Association and the American Library Association have committees on classification which are co-operating to develop and expand a loan collection of library classification schemes in all fields of knowledge. The Chairman for the second association is Mrs. Phyllis Allen Richmond, who is already known to readers of the Journal for her contributions to the history of medical education and of the germ theory of disease (Journal 1946, *1*, 115-143; 1947, *2*, 489-520; 1954, *9*, 290-303, 428-454). Through her it is earnestly requested that librarians or owners of collections in the history of medicine and allied sciences who have developed special classification schemes send a copy to Dr. Jesse H. Shera, Curator, SLA Loan Collection, School of Library Science, Western Reserve University, Cleveland 6, Ohio. By consulting and considering such schemes librarians of similar collections will benefit and library service will be improved.

City fathers who for practical reasons assign ordinal numbers or letters of the alphabet as names for streets turn their backs on history thereby and deprive future citizens of one opportunity to appreciate the past. In Rome, by contrast, history is important. Pietro Romano in his volume *Roma nelle sue strade e nelle sue piazze* (Roma, Fratelli Palomba, 1959, 485 p.) lists the Eternal City's streets and squares and gives a full explanation for each name. In the vicinity of the great complex that is the Policlinico names eminent in medicine abound—the Viale Ippocrate, the Piazza Galeno, the Piazza Salerno, and streets fittingly called after Giorgio Baglivi, Alfonso Borelli, Maurizio Bufalini, Cornelio Celso, Andrea Cesalpino, Bartolomeo Eustachio, Girolamo Fabrizio, Gabriele Falloppio, Gerolamo Fracastoro, Giovanni Maria Lancisi, Mondino de Luzzi, Marcello Malpighi, Giovanni Battista Morgagni, Antonio Musa, Francesco Redi, Antonio Scarpa, and Lazzaro Spallanzani. Italian names predominate, but the services of "Andrea Vesalio" at Padua are also memorialized. Scattered elsewhere in the city are the Via Giacinto Albini, the Via Ulisse Aldrovandi, the Via Guido Baccelli, the Via Domenico Cirillo, and the Via Bernardino Ramazzini, and with a special sense of fitness the street which leads from the Via Trionfale to the Manicomio Provinciale has been renamed the Via Vincenzo Chiarugi.

The talents of medical historians extend often to wider fields. L. R. C. Agnew is one of two faculty advisers for *Spectrum*, the new literary academic publication of the University of Kansas. Volume 1, Number 1, April, 1960 carries on pages 17 and 44 L. R. Lind's tale "The Road to Buín" and on page 22 his translations of German poems by Rainer Maria Rilke and Bertolt Brecht.

It seems unlikely that Chauncey D. Leake, during his terms of office as President of the American Association for the Advancement of Science and of the American Association for the History of Medicine, will make any more appealing suggestion than is embodied in his proposal to restore

the balance between motor vehicles and trees. The former puff out carbon dioxide, the latter reverse the process. Therefore, says Dr. Leake, let 10 trees be planted for every car, 100 for every truck, and 1,000 for every airplane. And, as one editorial puts it, "Drives into the country show that there are not nearly enough trees because you can still see the billboards."

Victor Gomoiu 1883-1960

The Journal learns with regret from Madame Doctor Viorica Gomoiu of the death of her husband, Victor Gomoiu, M.D., Honorary President of the International Society of the History of Medicine, on Saturday, 6 February 1960, at the age of 77, after a long and painful illness courageously borne.

Among Dr. Gomoiu's many memberships and associations, that of his Presidency of the IXth International Congress of the History of Medicine held at Bucarest in September 1932 will long be remembered by those fortunate enough to have attended.

Book Reviews

BERNHARD J. STERN. *Historical Sociology* (Selected Papers). New York, Citadel Press, 1959. xii, 433 pp., $5.00.

Reviewed by MILTON I. ROEMER, *Director of Research, Sloan Institute of Hospital Administration, Graduate School of Business and Public Administration, Cornell University, Ithaca, New York.*

SOCIOLOGY is a young science and in America it has bred many schools of thought. Predominant in recent years has been observational research, measuring social phenomena of every sort. There has been reaction against the armchair philosophers who spun great social theories by reading history books. But observational research can be sterile, when it examines trivial problems whose attraction is their measurability rather than their social importance. And history, indeed, has important sociological lessons to teach, when it is studied critically and integrated with data from current social experience. A more mature sociology, therefore, is now turning again to history and making use of it as a powerful tool for deriving generalizations about group behavior.

An American sociologist ahead of his time in this use of history was Bernhard J. Stern, whose selected papers are now published three years after his death. A prolific and highly versatile scholar, Stern's interest ranged over the entire field of sociology. As this collection of 26 essays demonstrates, he made contributions of importance on general social theory, social aspects of technology, the family, heredity in relation to environment, ethnology, and the sociology of medicine.

In addition to his skillful use of historical data for the elucidation of current problems, Stern's writings have another common theme. He was philosophically a materialist, believing that the modes of production and the relations of people to them were the most basic determinant of the way of life and ideology in any society. As a Marxist, however, he was not rigid; he was highly critical of the all-too-frequent vulgarization of this approach and recognized fully the impact of other social factors as well.

In the sociology of medicine, Stern was a pioneer. Before any other sociologist in this country, he devoted extensive scholarly study to the problems of innovation in medical technology and the application of medical science to social needs. Six of the papers in this volume are in this field, including a truly classical contribution on "Resistances to Medical Change." Closely related are his papers on the "frustration of technology" in a free-enterprise framework, which often permits profits for a few to thwart the social good of many.

Stern's deep interest in science, medical and general, sprang from his conviction that the best society was one based on objective and demon-

strable truth, rather than religious faith, mysticism, or *a priori* concepts of individual morality. He felt deeply, moreover, that the goal of science must be not knowledge for its own sake but for its social application, and indeed for social reform. No pedant, he saw the task of sociology as achieving an understanding of everyday problems so that they could be conquered. He did not shun value judgments, and he directed his scholarship toward issues in sociology and anthropology which tested the results of democratic versus authoritarian principles.

These essays by Bernhard J. Stern are a fitting memorial to a courageous social scientist who did not hesitate to espouse unpopular causes when the welfare of common people was at stake. But more important, they preserve in a finely published book a rich collection of essays, some not before printed, demonstrating the fruitfulness of an historical sociology for achieving an understanding of the dynamics of society and man.

Histoire Générale des Sciences. Tome II. *La Science Moderne (de 1450 à 1800).* Publiée sous la direction de René Taton. Paris, Presses Universitaires de France, 1958. vii, 800 pp., illus.

Reviewed by CHARLES DONALD O'MALLEY, *Professor of Medical History, UCLA Medical School, Los Angeles, California.*

THE first volume (1957) of this work, to be comprised of three volumes, carried the story to approximately the year 1450, and the second volume now under consideration continues it to the close of the 18th century. As was the case of volume one, technology has been excluded since that subject will be treated in a separate series of volumes; on the other hand, medicine is included, as in the previous volume, since "if by reason of its goal, medicine is a technique . . . yet its development is too closely bound to that of biology to be left out."

Under the editorial direction of René Taton some 25 scholars have collaborated in the composition of the second volume; and whereas in the first, consideration of the science of the Far East led to the inclusion of one English scholar in an otherwise French group, now a concern with colonial America has required the assistance of an American scholar. Essentially, however, the volume deals with scientific developments in Europe, although occasionally there is perhaps a too great emphasis upon the history of scientific development in France at the expense of significant developments elsewhere. This is particularly true in the treatment of medicine, 1450-1600, in which the significance of the Paduan medical school is incorrectly allowed to be somewhat overshadowed by activities in Paris. Furthermore, in this account of renaissance medicine the all-too-brief mention of the development of anatomy pays no heed to the contributions of Achillini, Benedetti, Berengario, Massa, or Canano. It is, incidentally, the poorest of the several brief sections of the book devoted to medicine and includes

such errors as the association of Colombo with the Bologna medical faculty and Eustachius with Pisa.

The account of 17th century medicine is better balanced, drawing examples more from Europe as a whole, although the discussion of the discovery of the circulation of the blood gives no recognition to Valverde, gives the date 1551 to Servetus' discovery (presumably alluding to the publication of the *Christianismi Restitutio,* actually published in 1553), and ignores the vital work of Malpighi. Eighteenth century medicine is better treated than either of the preceding sections, possibly because, or at least in part because, the author had a little more space at his disposal. Indeed, part of the above criticisms should perhaps be directed against an editorial policy which so severely limited the space allotted to medicine which might better have been excluded entirely from the volume. Furthermore, the division of the subject by centuries written by different authors tends to hamper any proper illustration of the development of such themes as that of the discovery of the circulation of the blood, and inevitably certain matters fall neglected between the accounts.

Despite these few criticisms, the book as a whole can be read by the nonspecialist with considerable profit, and especially those portions dealing with the exact sciences even though consideration of them here would be outside the scope of this journal's major interest. The individual chapters are concluded with bibliographies which appear on the whole to represent a sound choice of works for further general reading, although the general reader might make better use of them if the bibliographies had been briefly annotated. The indices of names and subjects are satisfactorily detailed, and the illustrations are handsome even though they serve but little purpose insofar as assisting the reader in the comprehension of problems presented in the text.

RICHARD SHRYOCK. *Medicine and Society in America, 1660-1860.* New York, New York University Press, 1960. 182 pp.

Reviewed by WILLIAM C. GIBSON, *Kinsmen Professor of Neurological Research, University of British Columbia, Vancouver, Canada.*

THE substance of this volume is comprised of the four Anson G. Phelps Lectures in early American history which Dr. Shryock delivered at New York University in 1959. It takes its place beside other distinguished volumes in that series dealing with such subjects as *The Colonial Craftsman* by Carl Bridenbaugh and *Conservatism in Early American History* by Leonard W. Labaree.

Professor Shryock traces the origins of the medical profession in early colonial times and moves then to the development of medical thought and practice in those years. Health and disease, from 1660-1820, are followed in the final chapter by a study of medicine and society in transition, 1820-1860.

The sweep of the work is excellent, and the stirring times of which Professor Shryock writes need to be recalled to us in an age when everything is taken for granted and where any suggestion that people struggled to give us the country in its present state is thought sentimental. On the other hand, the treatment of this great period which we find in these lectures is lacking in excitement. Everything is served up in such a pedantic fashion that nothing stands out sharply on the landscape. This may arise from a nonmedical historian trying to write on a medical subject, but, in all truth, the years 1660 to 1860 were much more exciting and critical ones in the formation of the present United States than one gathers from this volume.

Think of the reaction of a foreign student of the American scene coming upon a passage such as this: "Demands for cleanliness in the related field of obstetrics were made in the 1840's by both Semmelweis in Vienna and Oliver Wendell Holmes in Boston. But these efforts accomplished little . . ." Some would feel that an American pioneer of Holmes' stature should have been given a little better part to play than this. Despite these faults in perspective, at least as they seem to a mere physician, the book is excellently documented and filled with facts.

K. E. ROTHSCHUH. *Theorie des Organismus. Bios, Psyche, Pathos.* Muenchen, Berlin, Urban & Schwarzenberg, 1959. XV, 330 pp. 33 illus. DM. 48.

Reviewed by GERNOT RATH, *Associate Professor and Chairman of the Department of History of Medicine, University of Wisconsin Medical School, Madison, Wisconsin.*

MODERN medical research has achieved its great success of the last decades through analytical procedures. No time remained for synthesis, for exploitation of the results of its research for an entire picture of the nature of man. A medical anthropology, moreover, has for the scientist a somewhat suspicious tinge; for he is reminded of the many theories and systems of recent and past history, the hypotheses of which soon proved to be untenable. And yet such a synthesis, an entirely new view, has become more and more urgent in recent years; the many voices that emphasize its necessity justly point out that especially now one has to use the indispensable theories in order to unite the fragments of experience and the numerous individual results of research to a whole.

In the book at hand, Rothschuh makes the welcome attempt to develop a theory of organism, an entire picture of the nature of man from the results of the experimental sciences (physics, chemistry, biology, physiology, pathology, and psychology). He uses for his synthesis only the interpretation of these results and separates all procedures which attempt to bring the phenomena of Bios, Psyche, and Pathos on the basis of sociological, theological and philosophical considerations into rational connexion. He

disclaims from the beginning any answer to the question concerning the 'where-from,' 'where-to' and 'what-for' of man.

The author has all the attributes for this difficult undertaking. As a physiologist, he is familiar with most of the questions mentioned through decades of experiences; as an historian of medicine he knows through his knowledge of history about the dangers which threaten his experiment. Besides, for over 25 years he has occupied himself with general basic problems of a scientific-theoretical nature, with the question about the living, its organization, the relation between life and soul, and the pathological phenomena. His first publication concerning this subject appeared in 1936 (Theoretische Biologie und Medizin, *Neue Deutsche Forschungen*, Vol. 83). Now he takes up again the old subject always dear to him and attempts to answer it with the latest results of scientific research and with expanded theories. If he often transgresses, or must transgress, the limits of his special field, this is not unexpected in such a complexity of questions. The author himself points this out in the Preface.

Rothschuh, after general preliminary remarks about the method of his investigations, which he calls "Szientifikation," divides his book into the three large basic phenomena of medicine: life, soul, and disease, which he treats as a whole. With this highly factual book it is not the task of the historian of medicine to attempt a critical discussion of Rothschuh's ideas and thoughts, for he would irresponsibly enter areas which belong to the working sphere of the physiologist, the biologist, the psychopathologist, and psychologist and which can only be surveyed by them as a whole. The historian of medicine can only refer to a few important, often fascinating, theories of the author which must come under the fire of criticism.

Rothschuh keeps himself equi-distant from mechanists and vitalists. He is not satisfied alone with a causal analysis since it explains only the cause; but he also declines, for important reasons, Hans Driesch's theory of "Entelechie." Research had made its best experiments by renouncing the "Entelechien." Modern life research could only take a position between mechanism and vitalism. Man enters the area of medicine as a creature of nature and culture. The significance of his biological roots has so far been underrated by theologians, philosophers, and sociologists. Rothschuh defines the soul as the "Flow of Inner Events," as the whole of conscious, inner experiences. This experience is—according to Rothschuh's convictions—so intimately connected with the somatic functions of the central nervous system that it seems to arise with the development of central nervous processes. Attendant somatic symptoms, whose initiation we attribute to psychic factors (excitement, instinct, humor), Rothschuh traces back to the simultaneous activity of the central nervous system. The lead of the psychic life he transfers to the organic part. "The psychic is not a *causa efficiens*, but a *qualitas accidens*" (p. 195). That is one of the essential sentences of his suggestions about Bios and Psyche. Bionom and psychonom

events go side by side. One does not affect the other, their connexion has rather the characteristics of attachment and correspondence. In consistent pursuit of this path, Rothschuh therefore also declines a psychic influencing of the body in the sense of a psychogenic disorder of organs (p. 266). Where the results of experimental science do not yet allow final statement, he must rely on hypotheses, which he calls "necessary fictions."

Rothschuh's book will presumably kindle a lively commotion of the minds. Joyful agreements as well as most violent criticism will be heard. In any case, the author deserves special recognition for having taken up this urgent as well as difficult problem, for having written a theory of organism, and for having developed a picture of man in medicine. As a physiologist he has returned again in our time to the old traditions of his science, where until far into the 19th century to sketch an entire picture of man and his actions in life was considered as the most important and most noble task.

Directory of the Medical Library Association [compiled by Mrs. Henrietta T. Perkins, Chairman, Directory Committee]. Forword by John F. Fulton. 2d. ed., Hamden, Connecticut, The Shoe String Press, Inc., 1959. xxxii, 274 pp. $7.00.

Reviewed by THOMAS E. KEYS, *Assistant Professor of History of Medicine, Mayo Foundation, Graduate School of the University of Minnesota, and Librarian of the Mayo Clinic, Rochester, Minnesota.*

THE library has often been called the heart and center of any institution of higher education for in it are collected the records of the past and present which bear on the work of the institution. The collective experience of medical libraries certainly is of utmost importance to the present and future practice of medicine. The *Directory* under review is an achievement of no small means, and its compiler, Mrs. Perkins, Assistant Librarian, Yale Medical Library, and her committee of five deserve unstinting praise for the result of their efforts.

The arrangement of 558* "institutional members is *geographical* with libraries entered alphabetically, first under state and then under city. . . . Material is registered in the following form: name of medical library, address, telephone number, key number, year founded, source of support, annual budget, name of librarian, name of associate or assistant librarian . . . staff . . . number of volumes, pamphlets, current periodicals, annual circulation, interlibrary loan privileges . . . classification system, and special collections."

An alphabetic list of members of the Association is given, together with their addresses and affiliations. There is also an index to names of libraries and the outstanding items which are listed under special collections. By rearranging some of the data, the reviewer has drawn from the book some

* Including six new ones in the "Addenda."

interesting general information concerning libraries and their methods. Several lists are included to illustrate the reference value of the book.

The first list gives the type of classification in use in the 558 libraries.

Classification	*Number of Libraries*
Boston Medical	105
Library of Congress	102
National Library of Medicine	102
Dewey	101
Cunningham	48
Own	21
Barnard	10
Bellevue	6
James A. Miller	3
Black	2
Bliss	2
New York Academy of Medicine	2
Universal Decimal	2
College of Physicians & Surgeons, Philadelphia	1
Cutter	1
E. J. Heath	1
Nippon Decimal	1
Veterans Administration	1
No classification	47
	558

Twenty-seven libraries use two classification systems. In these cases an arbitrary decision was made to keep the total straight.

Thirteen libraries received 2,000 to 12,000 current journals in 1959; 33 received 1,000 to 1,999; 86, 500 to 999; 137, 200 to 499; 168, 100 to 199; and 97 received 1 to 99 journals. No information was given on this point for 24 libraries. The 13 that received the largest number of journals in 1959 are as follows:

Name of Library	*Number of Journals*
National Library of Medicine	12,000
New York Academy of Medicine	3,200
University College of the West Indies Medical Library, Kingston, Jamaica	3,181
Columbia University Medical Library	2,800
University of California Biomedical Library, Los Angeles	2,800
Centro de Documentacion Cientifica y Tecnica de México	2,710
Medical Society of the County of Kings & Academy of Medicine of Brooklyn	2,400
College of Physicians of Philadelphia Medical Library	2,169
Lane Medical Library, Stanford University	2,025
The John Crerar Library	2,000
The Mayo Clinic Library	2,000
National Institutes of Health Library	2,000
World Health Organization, Palais des Nations, Geneva, Switzerland	2,000

When the number of bound volumes was considered, it was found that 384 libraries had 5,000 to 24,999 volumes; 72 had 25,000 to 49,999, 43 had 50,000 to 99,999, and 26 had more than 100,000. Information was not available concerning the number of volumes in 23 libraries. The nine medical libraries that contained more than 200,000 volumes in 1959 are as follows:

Name of Library	*Number of Volumes*
National Library of Medicine	515,400
New York Academy of Medicine	321,000
Yale Medical Library	301,274
The Wellcome Historical Medical Library (London)	250,000
Royal Society of Medicine (London)	250,000
Boston Medical Library	236,802
Columbia University Medical Library	215,000
University College of the West Indies Medical Library (Kingston, Jamaica)	202,774
Library of Congress	200,000 (approx.)

MAURO MADERO. *Historia de la Medicina en la Provincia del Guayas.* Imprenta de la Casa de le Cultura, Nucleo del Guayas. Guayaquil, Ecuador, 1955. ix, 283 [2] pp., illus.

Reviewed by F. GUERRA, *Research Associate, Yale University School of Medicine.*

ALTHOUGH many important studies on Peruvian medicine have already been published, only a few, and these not always very authoritative, have so far been published on the history of medicine in Ecuador, which was medically integrated with Perú at one time. The area of Guayaquil may in many ways be compared favorably with that of Quito, the capital of Ecuador, and for this reason Dr. Mauro Madero's book fills a large gap in the available information on the province of Guayas, the district of Guayaquil, Ecuador.

Only one chapter is devoted to the culture of the Huancavilca Indians of the area, giving an account of the main ethnological features, cranial and dental induced deformities, food, hygiene, and the extent to which syphilis and other infectious diseases have spread among them, but the material is well arranged and presented. Six chapters are devoted to the colonial period, first presenting the principal medical problems occasioned by the Spanish Conquest, such as the spread of "verruga" or neurobartonellosis among the Spaniards, and the devastating effects of smallpox among the Indian population. Information is offered about the early foundation of hospitals in Guayaquil, on medical books and doctrines imported from Spain, and on the control of professional practice by the rather distant Protomedicate at Lima, Perú. Some of the medical figures of the period receive detailed treatment, such as Martin de Porres, friar-surgeon, and the Indian botanist Pedro Guerrero "Gallinazo" whose manuscript on the medicinal plants of Guayaquil has unfortunately been lost. He also con-

siders the development of obstetrics and the treatment of newborn tetanus under Juan de Nabez. The introduction of vaccination for smallpox in the first decade of the 19th century is discussed in great detail.

The last five chapters of the work deal with medicine during the War of Independence after 1820, in particular emphasizing the rôle played by Abel Brandin in those years in the introduction of quinine for the treatment of malaria, which had just been isolated by Pelletier in France. The author also discusses some new hospitals, epidemics of yellow fever, the establishment of the medical school, the development of medical specialties, and the most outstanding medical men in Guayaquil during the last hundred years.

Dr. Mauro Madero offers an excellent presentation of the subject, with a balanced appraisal of the original sources which is more apparent in dealing with aboriginal and colonial medicine in Guayaquil. For this reason Madero's book deserves a warm welcome from medical historians and should become well known. Dr. Mauro Madero, who was formerly Professor of Hygiene and Social Medicine at the Medical School of the University of Guayaquil, is the author of several other works on folklore, medical biography, tuberculosis, and tropical pathology.

GEORGE W. CORNER. *Anatomist at Large. An Autobiography and Selected Essays.* New York, Basic Books, 1958. 215 pp. $4.00.

Reviewed by THOMAS R. FORBES, *Associate Professor of Anatomy, Yale University School of Medicine, New Haven, Connecticut.*

PART of the fascination of a good autobiography is felt in those moments when the author really talks about himself, interrupting the tale of events and circumstances to draw aside the curtain that has shadowed the inner man. Then one can hope to learn not just what the author achieved but why he undertook the task, not alone when he made a decision but how and why. Such personal revelations may be deliberate, or they may be found implicit in the author's account of men and decisions. Thus, in the brief autobiography with which Corner's *Anatomist at Large* begins, characteristic modesty seems to limit his self-analysis, but here as throughout the volume his wisdom, eagerness, and compassion shine through his words.

The autobiographical record is simple and unassuming but far from dull. There is the picture of a happy boyhood, kind and wise parents, and some excellent teachers, including Edward Lucas White, who seems to have made the learning of Latin as fascinating as his historical novels. Corner was equally fortunate in the opportunity during college and medical school to learn from a series of great teachers and older colleagues, among them Mall, Florence Sabin, H. M. Evans, Welch, Halsted, Kelly, Cushing, and Adolf Meyer. Small wonder that medical science and medical history were exciting!

In 1924, at the age of 34, Corner was appointed Professor of Anatomy in the medical school then being organized at the University of Rochester. The story of his richly productive years there as teacher and as discoverer with Willard Allen of the hormone progesterone is told clearly and modestly. Equally interesting is the succeeding period, beginning in 1940, when Corner returned to Baltimore as Director of the Department of Embryology of the Carnegie Institution, a busy time of collaboration in research and of increasingly arduous administrative assignments. Retirement in 1955 brought a change of scene but scarcely of pace. Nor, it is clear, would he have had it otherwise– ". . . the scientist . . . is, in fact, generally a happy person, for he always has something to do."

The ten essays and addresses selected for this volume illuminate Corner's range of interest, his scholarship, and his great understanding of man and nature. Indeed, as he infers, the two can scarcely be separated. Here are exciting and colorful medical history, sound views on education, inspiring advice for the graduating medical student, lucid accounts of research, and a revelation of personal philosophy and spiritual belief. Each paper, like the autobiography, has the solid, hard-won literary craftsmanship, the integrity of phrase and clarity of style, which do honor to Corner in all that he writes and which perhaps are not surpassed among contemporary scientist-writers, at least on this side of the Atlantic.

HAMILTON BAILEY and W. J. BISHOP. *Notable Names in Medicine and Surgery*. London, H. K. Lewis and Co. Ltd.; Springfield, Illinois, Charles C Thomas, 1959. 3d ed. xiv, 216 pp., 79 portraits, 162 illus. 35s.

Reviewed by the EDITOR.

THIS beautifully printed and illustrated new edition of Bailey and Bishop's well-known book should be a *vade mecum* of all medical students in school and out, for it will obviously be as valuable to the general practitioner as to the neophyte beginning his studies. As pointed out in the Preface this edition differs from the first two in a number of important details. Since it first appeared 15 years ago, significant advances in knowledge have brought new eponyms. Footnotes have also been included in this edition giving "salient details of persons mentioned in the text, or explanatory or interesting data to supplement the text." These footnotes are brief and to-the-point and printed in such tiny italic type as to make them almost illegible, but *multum in parvo!* In offering thanks to a nameless doctor who had sent in valuable suggestions for this edition the authors discovered to their dismay that the good doctor's letter had been misfiled and could not be found. How comforting this is to anyone who carries on a large correspondence! The authors make a welcome announcement that a sister volume will presently be published under the title *More notable names in medicine and surgery*.

The illustrations are beautifully reproduced, some in colour. An idea of the scope of the individual entries can be gleaned from the skilfully worded introductory headings such as that for Percival Pott (1714-1788): "Pott's fracture, Pott's disease, Pott's puffy tumour" (p. 31); or that of Sir Benjamin Brodie (1783-1862): "Brodie's abscess, Sero-cystic disease of Brodie" (p. 48). Sir Victor Horsley (1857-1916) comes down to us for his "wax" rather than for his surgery (p. 155), and the handsome August von Wassermann (1866-1925) for his "Reaction." There is a biographical list "For further reading" arranged alphabetically (pp. 200-206) followed by a good index with the principal names in bold-face type. The American edition is stoutly bound in heavy amber buckram.

LAWRENCE BABB. *Sanity in Bedlam: A Study of Robert Burton's "Anatomy of Melancholy."* East Lansing, Michigan State University Press, 1959. xii, 116 pp. $5.00.

Reviewed by DAVID NOVARR, *Associate Professor of English, Cornell University, Ithaca, New York.*

PROFESSOR Babb's definitive treatment of *The Elizabethan Malady* has qualified him pre-eminently to anatomize Burton's book. His knowledge of the technical literature on melancholy permits him to state authoritatively that "less than a fourth of the *Anatomy* is devoted, in any strict sense, to medicine, physiology, psychology, and psychiatry." His fine analysis of the structure and the growth of the book has shown him where Burton's main interests are. In five revised editions, Burton never changed his detailed arrangement of topics by partitions, sections, members, and subsections. The only topic he ever added was that on the "Symptoms of Maids', Nuns', and Widows' Melancholy" in Part I of the third edition (1628). The only substantial continuous addition he ever made was a "comfort [for] an afflicted conscience" in the last subsection, written for the second edition at the behest of his brother George and a former chamber-fellow at Oxford. Still, between the first and the sixth editions, Burton increased his book by about sixty per cent. Since he never rearranged his technical material and never added substantially to it, his amplification takes the form sometimes of independent comment and elaboration, more often of new illustrations and quotations in the non-technical passages of the book. Burton's main interest lies in these, and Professor Babb tells us why. His search for the sources and analogues of the *Anatomy* has shown him its relation to the treatises on the passions, the moral psychologies of the time, from Thomas Rogers' *Anatomie of the Minde* (1576) to Edward Reynolds' *Treatise of the Passions and Faculties of the Soule of Man* (1640). These volumes do not dichotomize natural and moral philosophy. Their purpose is not merely to impart information; their normative assumption is that self-knowledge is necessary to self-control and to virtuous conduct. Professor Babb suggests that Burton started out to write a psychological treatise,

but that his consideration of the comprehensive nature of the causes of melancholy caused him to move beyond physiology and formal psychology; the primary theme of his book became, then, an examination of the conditions of human life. In similar fashion, he suggests, Burton saw that medical therapy dealt inadequately with the basic psychological and social causes of universal melancholy, and the secondary theme of his book became the setting forth of rational principles for the conduct of life and the reordering of society.

Re-examination of the emphasis of the *Anatomy* and study of Burton's scholarship and science have led Professor Babb to qualify Osler's statement that the *Anatomy* is the greatest medical treatise ever written by a layman. The Burton who emerges from his pages is an eclectic Renaissance humanist. Burton may refer to St. Augustine more than to any other theologian, but Augustine has no pervasive influence on his religious doctrine; he finds it convenient to use Augustine's support on various matters. He cites dozens of Renaissance medical writers, ten of them more than fifty times each, but his approach is still essentially Galenic, authoritarian, and traditional. He mentions Fracastoro, Paracelsus, Vesalius, Fabricius, Paré (though not Harvey); but perhaps because their most significant contributions do not impinge directly upon the *Anatomy*, he does not show any real appreciation for them. Though he keeps abreast of the new science, he has no real familiarity with Bacon's manifestos for experimental learning, and he defends physiognomy, chiromancy, and metoposcopy. Professor Babb praises Burton's humanity and common sense, but he does not think that the greatness of the *Anatomy* is in its medical content.

He is, of course, quite right. But he professes to write "a preface to Burton's *Anatomy*," and he knows that humanity and common sense are not enough to explain the glory of the *Anatomy:* he would show the justice of Burton's identification with Democritus, he makes a few stabs at describing Burton's style, and on the last page of his book he says that Burton "has written a book abounding in gaiety, wit, humor, and satiric salt." His own book, perhaps because of the scientific context which greatly helps to illuminate Burton's real interest or because of the exigencies of publishing which call for innumerable ellipses in citing Burton's opinions, reveals, unfortunately, a dry and cold humour. An adequate preface to the *Anatomy* ought to try to tell why this was the only book that took Dr. Johnson out of bed two hours sooner than he wished to rise. Johnson knew well enough what constitutional melancholy was, and he knew Burton well enough to say that one must divert distressing thoughts and not combat them. "To attempt to think them down is madness." The mind must fly from itself—to chemistry, rope-dancing, or whatever (Burton's whatever's included the classics, Scripture, and shorthand). Johnson himself praised the great spirit and power of Burton's mind and he said that the *Anatomy* was "perhaps, overloaded with quotation," but I would guess that what

Anthony à Wood called Burton's "dextrous interlarding" had something to do with getting Johnson out of bed. Burton avoided the snares which appeal to modern divines who would be physicians; he knew that one did not arrive directly at peace of mind by positive thinking. Like one of his most distinguished followers, he loaded every rift with ore. His method was indirect, digressive, agglomerative, and the accumulating stories and quotations enhanced a satiric technique similar to that of Ben Johnson, whom he admired: they magnified follies into absurdity.

J. E. SCHMIDT. *Medical Discoveries: Who and When.* Springfield, Illinois, Charles C Thomas, 1959. ix, 555 pp. $14.75.

Reviewed by HENRY R. VIETS, *Curator, Boston Medical Library, Boston, Massachusetts.*

THIS comprehensive dictionary, containing many references to dentistry, pharmacy and related fields of medicine, and even a few surprising disclosures, proves to be a most useful book, but it must be used with caution. Any reference book by a single author, not thoroughly sifted by two or three revisions, is bound to contain errors and this one is not free from them. The monograph deals, in alphabetical order, with *What, Who* and *When,* but not with the exact *Where* or the more elusive *Why.* Medical disclosures, the "first" or presumed first description of a disease, operation, procedure, instrument, invention or law of nature, are described and annotated. Usually only the year of the contribution is given without further details of citation. Occasionally a hint is given where to look for a complete reference, as in Parry's *Collected Works* (1825), for his description of exophthalmic goitre.

There is considerable incompleteness: *Huguier's canal* is cited, but *Huchard's sign* (for hypertension), *Humphry's operation* (for excision of the condyle of the lower jaw), *Hunter's operation* (for proximal ligation of an aneurysm), are unlisted. *Hueck's ligament* is found under pectinate ligament, but not under Hueck, thus emphasizing the need for an author index. The book's usefulness would be greatly enhanced by such an addition.

In most instances, dates, names, and designations of the discoverer's status are correctly given. A few slips occur, such as the recording of Morton's etherization on 16 October 1846 for a "tooth extraction." The author, not always certain of a fact, has been justifiably cautious: Savill "is believed to have been the first to describe epidemic exfoliative dermatitis, in 1891" and Golgi "is credited with distinguishing between the quartan and tertian parasites, in 1889." In some cases it is quite frankly stated: "date not available." The difference between "recorded in 1894" and "published in 1894," both forms being used, is not quite clear.

The reference librarian, with her precision microscope, will no doubt find other deviations, but with the indispensable *Garrison and Morton*

(2d ed., 1954), *Blakiston's New Gould* (1949), the *Medical Classics, Bailey and Bishop* (3d ed., 1959) and other convenient tools at hand, Schmidt's compilation, although leaving something to be desired, will find its place on the shelf behind her desk and not infrequently provide her with the clue to *What, Who* and *When* in medicine. Of course, all references found must be finally rechecked at the source.

AUDREY W. DAVIS. *Dr. Kelly of Hopkins, Surgeon, Scientist, Christian.* Baltimore, The Johns Hopkins Press, 1959. 242 pp.

Reviewed by LAWRENCE R. WHARTON, M.D., Assistant Professor of Gynecology, The Johns Hopkins Hospital, Baltimore, Maryland.

THIS small biography of a great man is delightful reading. It traces Dr. Kelly's life from beginning to end in a familiar way, as it should, for Audrey Davis practically lived in Dr. Kelly's home as his private secretary during the last 20 years of his life. The reviewer was also fortunate in having been one of Dr. Kelly's pupils and house officers at the Johns Hopkins Hospital and in having assisted him in the preparation of his last book. Hence, he is indeed glad that the story of this brilliant man has been written.

The book is well planned. The opening chapter covers the early years in an interesting manner. In the first section, the author depicts young Kelly as he interested himself in many different scholastic and athletic activities. He studied and loved to work with plants, butterflies, fungi, snakes, modern and ancient languages, camping, swimming, hiking, and religious affairs. This foreshadows his later accomplishments in his vocation and numerous avocations. However, at this time, Kelly was not interested in medicine—he planned to be a botanist or naturalist. These data are collected from his own diary and family records.

The author deals with Kelly's years in Medical School at the University of Pennsylvania in a rather superficial though interesting way. His adaptability to misfortune is shown by his reaction to the break in his heretofore untiring health, which compelled him to drop out of school for a year which he spent in Colorado, working on a ranch. During that time he tended cattle and did the usual chores of a hired man on a ranch. However, he also seized the opportunity to study the plants and wild animal life of Colorado, collecting numerous specimens and studying the diseases of the animals on the ranch. When it became known that he was a medical student, his services were called upon, and he had his first obstetrical case. In later years, when he returned to Colorado as a famous surgeon, he looked up his old friends and especially the infant, now grown to manhood, he had delivered many years before.

The first years of Dr. Kelly's life as a physician are well described but in no great detail. His father planned for him to live and practise in the nice residential section where his parents lived and equipped a suitable office for him in that section of the city. Young Kelly, however, wanted to

practise among the poor people who had been his patients while he was a medical student and later an intern in the Episcopal Hospital of Kensington and it was therefore among them in Kensington that he set up his office.

Perhaps the records of Kelly's life in these formative years from 1882 to 1889 are lacking, but it would be marvellous if one could discover and assemble them. This, unfortunately, is not done in this biography. During these seven years, Kelly published 79 articles, far more than most prolific surgeons publish in a lifetime. He must have studied the problems of surgical infections, hemorrhage, and operative technique because he became a successful surgeon in a period when almost no surgery was done. He successfully removed an ovarian cyst that weighed 116 pounds, operating in a third floor room of the patient's own home—the largest tumor of this type that had ever been removed in Philadelphia. In 1888, he performed a Cesarean section, the first successful one in Philadelphia in half a century. He also devised new operations, new methods of studying the urinary organs, the vagina and rectum. One of his old professors, Dr. William Goodell, also a famous gynecologist, told young Kelly he was too bold.

During these seven years, Kelly made frequent trips to Europe and Great Britain, for these clinics were the font of all medical knowledge in those days. There he made the acquaintance of many of the leaders in gynecology and other branches of medicine and kept up these acquaintances all his life. There was very little danger that Kelly would bury himself and be forgotten among the poor people of Kensington. At the end of these seven years, Kelly was appointed to the Chair of Gynecology at the University of Pennsylvania but was unable to fill that position because he was soon after chosen to be the first Professor of Gynecology and Obstetrics in the new Johns Hopkins University—at the age of 31.

The next thirty years of Kelly's life centered in the Johns Hopkins and this is the most constructive and enduring part of his amazing career. And yet, like his career at Kensington, it is described rather generally with very little regard for the details of his daily life, its many problems, its tragedies as well as its glories. Less than one-fourth of the book is devoted to his long career at Hopkins.

During these years, Kelly was indefatigable. His contributions were almost without number, including new methods of diagnosis such as the knee-chest position for the study of diseases of the vagina, bladder, and rectum. He perfected or devised new operative procedures to relieve conditions that had heretofore been incurable or very intractable. He trained gynecologists patiently, without tiring, so that many of his residents became leaders in other university clinics. One does not accomplish such far-reaching results without intense study and application and without tragic failure before attaining crowning success. The story of this personal struggle is told very briefly in this biography. Possibly it could be reconstructed i

part by reading his contributions to the medical literature of that time. It could best have been told by one who lived at least part of those years with him, but these physicians have passed on.

During these intensely busy years, Kelly kept up his travels abroad. Now he often went to receive honors from universities, and these experiences are well described by the author. He also kept up his numerous avocations, as is well described in the closing sections of this biography.

The last twenty years of Kelly's life are described most pleasingly by Audrey Davis for she spent those years in his household. When Dr. Kelly resigned from the professorship at Hopkins, he directed his entire professional zeal and skill to his sanitarium, and he became even more active in his numerous avocations. These years are familiarly described by the author, who shared and recorded these events as they occurred.

He laid the foundations for irradiation in the treatment of many disorders, especially benign and malignant tumors of the reproductive organs. This was done in the face of much bitter criticism. The author describes Dr. Kelly's remarkable interest in all natural sciences, snakes, birds, fungi, mining, plants, swimming, camping, and traveling. His family life during the summer months at his camp in Canada is beautifully told. His religious activities continued unabated. In short, this is probably the most intimate and interesting part of the whole biography and brings to a close the inspiring story of the life of this remarkable man. In the opinion of the reviewer, in spite of some shortcomings, this story should be read by all young physicians and medical students. The only regret is that such a great man deserves a much more comprehensive biography.

The Rudolph Matas History of Medicine in Louisiana, Vol. 1, Edited by John Duffy. Baton Rouge, Louisiana State University Press, 1958. 522 pages.

Reviewed by MICHAEL E. DE BAKEY, *Professor of Surgery, Baylor University College of Medicine, Houston, Texas.*

IN 1926 Dr. Rudolph Matas accepted the chairmanship of a committee to prepare a history of the Louisiana State Medical Society. As the compilation of his material progressed, he widened his scope to include everything related to the history of medicine in Louisiana. In 1952 when age prevented Dr. Matas from continuing his project, he created a trust fund to meet the expense of publication of the History of Medicine in Louisiana as compiled and written by himself and his collaborators. Dr. John Duffy, Associate Professor of History at Louisiana State University, was named editor.

Volume I deals with the period from 1699 to 1825 when Louisiana was variously a part of the colonial empires of France and Spain and the United States. It is a thoroughly comprehensive work and should be of immense interest to medical historians as well as to the people of Louisiana who

will find fascinating such accounts as that of the establishment of New Orleans' Charity Hospital in 1736 by Jean Louis, who bequeathed his estate toward its founding, and the subsequent difficulties that beset this institution.

In 1726 the population of New Orleans, including slaves, numbered 855. The town was served by a physician, three surgeons, three male nurses, and probably a druggist, and it is stated that "probably no other community in North America at this date could show so high a ratio of doctors to population." No formal medical education was given during the colonial period, but it is evident that steps were taken relatively early to provide young colonists with an opportunity to study medicine. The regulation of 1725 requiring medical men to report all wounds inflicted by weapons specified that the law applied to all surgeons and medical students, indicating that some type of medical training was already available. Unlike the English colonies, where a young man could set himself up as a practising surgeon after a short period of service as an apprentice or assistant to a local doctor, the Louisiana surgeons were required to complete their formal training in the French military hospital at Rochefort. The editor states that "in the mid-eighteenth century surgical standards were far higher in France than in England, a factor which undoubtedly contributed to the high quality of Louisiana medical care."

Medical practices changed very little during the 18th century. The humoral theory still prevailed while depletion by means of bloodletting, purging, vomiting, and sweating remained a chief weapon in the medical arsenal. One provision at this time, which has long been superseded by more informed opinion, read: "Surgeons shall never depart from the subordination which they owe to physicians, and should reconcile themselves with the latter's judgment for the good of the patient, especially in the treatment of internal maladies." If "driven by the perversity of envy, they refuse the succor of their hands to a patient attended by a physician," they were to be sentenced to a fine of two hundred livres for the good of the Charity Hospital.

A number of anecdotes appear in this volume, especially concerning the various types of diseases with which the settlers were confronted. Venereal diseases were a constant problem, and during the 1730's a special hosital was built for these cases. The medicines administered typify the conglomeration of remedies considered essential at the time, including such items as sarsaparilla, manna, guaiacum, mercury, antimony, rhubarb, scammony and lemon juice, Mecca and Copahu balm, coral, crab's eyes, and lozenges of Landel. The editor comments that "in the light of the stern measures used to fight these infections, the victims could scarcely have doubted that the wages of sin were high."

The Negro slaves were perhaps hardest hit by the diseases of the area, and scurvy and yaws were considered the two most dangerous sicknesses to

the newly arrived slaves. LePage du Pratz, in summarizing the general treatment of these diseases observed: "In these two distempers the patients must be supported with good nourishment and made to sweat copiously. It would be a mistake to think that they ought to be kept to a spare diet; you must give them nourishing food but a little at a time. A negro can no more than any other persons support remedies upon bad food, and still less upon a spare diet. . . . Besides, good food makes the best part of the remedy to those who in common are but poorly fed." Du Pratz's cure for scurvy was basically sound: The cure consisted of making a paste of scurvy-grass, St. John's wort, and watercress pounded and mixed with citron juice. The patient was to keep some of this paste on his gums at all times except when he was eating. In addition he was required at regular intervals to drink an infusion of these same herbs. The paste and the potion were to be made without fire. Almost two centuries were to elapse before this bit of empirical knowledge concerning the needed vitamin C and the preparation of green leaves without heat could be confirmed by experimental science.

Cures for such lesions as carbuncles involved treatment with wine and brandy, and the editor observes that "while the external application of wine and brandy would have had only very limited therapeutic value, it is reasonable to assume that the patient's transition to the other world was eased by generous internal applications of these same prophylactics."

Descriptions of epidemics and pestilences and methods of caring for patients during the 18th and early 19th centuries are carried out with considerable editorial fervor. This volume is a fitting memorial to Dr. Matas in every way, and Dr. Duffy is to be congratulated on his method of handling the tremendous amount of material available to him.

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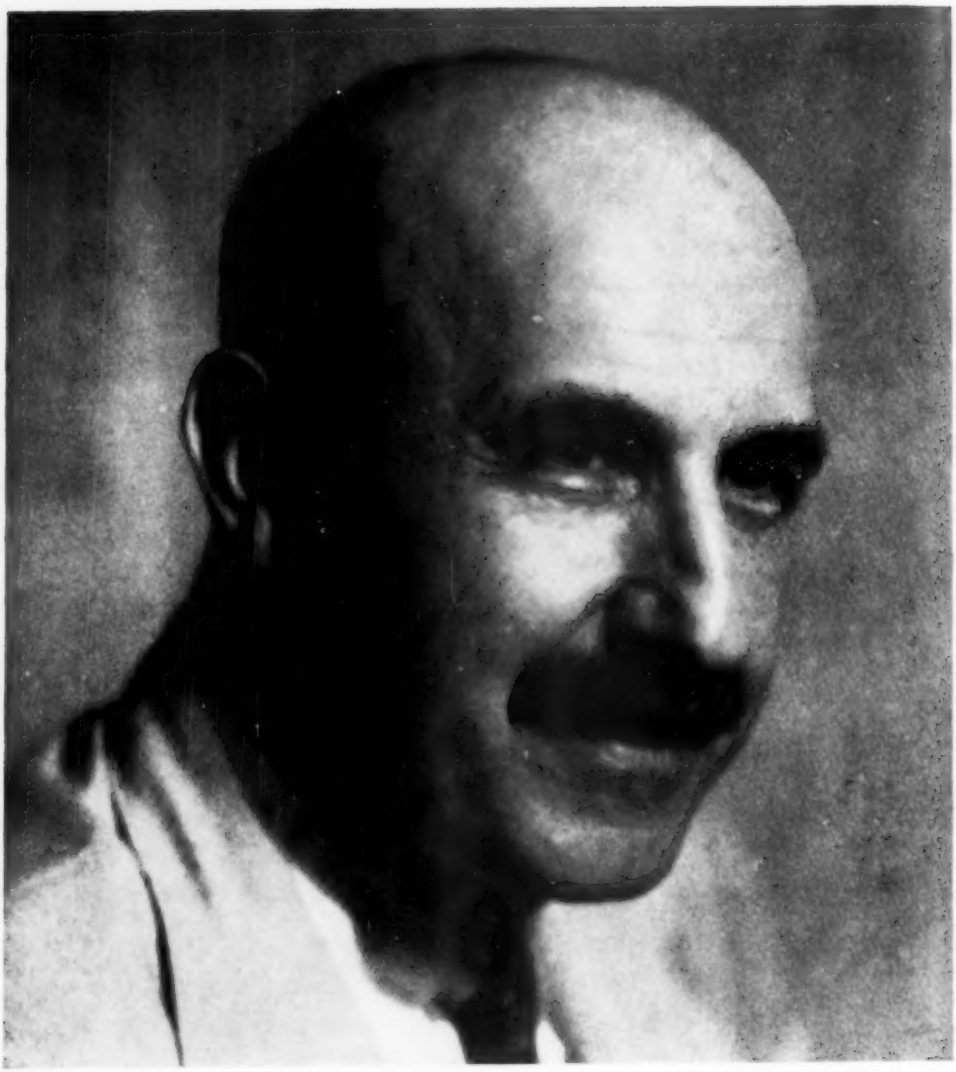

Bruno Kisch, M.D.

A Tribute to Dr. Bruno Kisch on the Occasion of his 70th Birthday

THE *Journal* takes please in congratulating Dr. Bruno Kisch on his 70th birthday and in wishing him many more years of fruitful work.

Dr. Kisch was almost 50 before he came to the United States. Born on 28 August 1890 in Prague, he had been educated at the University there and received his M.D. degree in 1913. After World War I he went to Cologne, working first with the younger Hering on the significance of the carotid body. When the medical faculty was reorganized in 1924, he became professor of physiology and biochemistry and head of the department. There followed years of energetic productivity, with summers spent in research in Naples. In 1927 he founded the Deutsche Gesellschaft für Kreislaufforschung, whose organ of publication is the *Zeitschrift für Kreislaufforschung*, and in 1937 he organized *Cardiologia;* both of these continue to flourish and he has remained an Editor of the latter up to the present. In 1938 he fled Germany and came for a time to Yale, where he was given a place in the Laboratory of Physiology. During his short stay there he collaborated with Louis Nahum and Hebbel Hoff in cardiovascular experiments which led to the publication of three papers.

After settling in New York he joined the staff of Mt. Sinai Hospital as cardiologist and then, following the pattern of his earlier years, he founded and became the editor of *Experimental Medicine and Surgery* (1943) and was one of the founders of the American College of Cardiology. Later, within this society, he established the Electron Microscopic Research Institute, became its director and continues in this post at the Elmhurst City Hospital at New York. And since summers at Naples were out of the question temporarily, he worked at Woods Hole in the Marine Biological Laboratory. He became Professor of Physiology and subsequently of Philosophy and History of Science at Yeshiva University and is also Medical Director of the University. In 1960 he was made a Consultant to the Smithsonian Institution in the field of Natural Sciences.

Although Dr. Kisch has made many contributions in the field of cardiology, for readers of the *Journal* his work in the history of medicine and science will have even greater appeal. During his

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American years Dr. Kisch has written *inter alia* several papers on weights and coins, two on 'Shekel medals and false shekels' and 'Judaica in nummis', a book on *Der Naturforscher Goethe* (1950), and a monograph on *Forgotten leaders in modern medicine: Valentin, Gruby, Remak, Auerbach,* published in 1954 by the American Philosophical Society. A born collector, he has assiduously built up personal holdings in a variety of fields: books, medical portraits, apothecary weights, medals, etc. and has worked for several years on a history of the apothecary weights. When in 1954 his application for a small grant to further this work was presented to the American Philosophical Society, it came before a committee on which Dr. Fulton served. He quickly suggested that Dr. Kisch come to New Haven to see the Edward Clark Streeter Collection of Weights and Measures and to give advice as to how the cataloguing of the Collection's vast holdings should proceed. As a result of this meeting, Dr. Kisch offered to take on this enormous task, and for the last six years, except when he was abroad in the summer, he has spent every Monday in New Haven describing each item with care and fidelity. At present all individual weights, the balances and steelyards have been finished, and the preparation of the catalogue is actively under way. For his 'labor of love' Yale owes Dr. Kisch a great debt of gratitude which it recognized by appointing him Curator of the Collections in 1957.

All this and much more Dr. Fulton would have wished to mention here; but we can rejoice that he was able to make a contribution to the Festschrift in Dr. Kisch's honor recently issued by the *Zeitschrift für Kreislaufforschung.** The *Journal of the History of Medicine* is proud to dedicate this issue to Dr. Kisch in recognition of his many contributions to medicine and science and to their history and to wish him many years of continued productivity.

THE EDITORS

* On his 60th birthday there were two jubilee volumes: *Cardiologia* (July 1950, *16,* 259-374) and *Experimental Medicine and Surgery* (Nov. 1950, *8,* 57-451). To one of these Dr. Fulton had also contributed.

Mr. Ferguson's Hypodermic Syringe

JOHN B. BLAKE*

THE syringe, in one form or another, is one of the most ancient instruments used in medicine, but its employment for the injection of drugs subcutaneously, for local or systemic effect, is hardly more than a century old. The early development of hypodermic medication has been carefully outlined by Norman Howard-Jones in this journal, and there is no need to repeat in detail this now familiar story.[1] Suffice it to note that in 1855 Dr. Alexander Wood of Edinburgh first published a description of the subcutaneous injection of a fluid drug for therapeutic purposes. He had tried several times previously to introduce morphine under the skin by acupuncture needles and otherwise without success. Late in 1853, while endeavoring to remove a nevus by injecting iron perchloride with "one of the elegant little syringes, constructed for this purpose by Mr. Ferguson of Giltspur Street, London," it occurred to Wood that this instrument might also be used for hypodermic injections; he tried it first on 28 November 1853, and it worked.[2] How much credit should be given to Wood, how much to Rynd of Dublin, or to other contenders for hypodermic honors will probably never be settled to the satisfaction of all, but it seems clear that the major share at least belongs to Wood.

Curiously, the "elegant little syringes" made by Mr. Ferguson[3] have not been accurately described. Howard-Jones was unable to trace an illustration, or, apparently, an original description of the Ferguson syringe, but he evidently assumed, as several other writers have, that Ferguson employed a hollow pointed needle similar to those in use today. Wood himself later modified Ferguson's syringe. His own instrument, Wood wrote, "is of the simplest construction. . . . It consists of a small glass syringe graduated like a drop measure, and to this is attached a small needle, hollow, and having an aperture near the point like the sting of a wasp."[4]

* Smithsonian Institution, Washington, D. C.

1 Howard-Jones, Norman. A critical study of the origins and early development of hypodermic medication. *J. Hist. Med.*, 1947, *2*, 201-249; Mogey, G. A. Centenary of hypodermic injection. *Brit. med. J.*, 1953, *2*, 1180-1185.

2 Wood, Alexander. New method of treating neuralgia by the direct application of opiates to the painful points. *Edinb. med. surg. J.*, 1855, *82*, 265-281.

3 Daniel Ferguson of 21 Giltspur Street, London, a surgical instrument and truss-maker and cutler. *Post Office London directory, 1852*. 53d ed. London, 1852. (See p. 729.)

4 Wood, A. Treatment of neuralgic pains by narcotic injections. *Brit. med. J.*, 1858, 721-723.

Howard-Jones assumes that Wood's modification consisted of "improvements to the cutting extremity of the needle" and the graduations. Actually, the improvement was more consequential, as the original description of Ferguson's syringe, quoted below, clearly shows. This description also makes clear that Ferguson's instrument, while undoubtedly "ingenious," was also, in all probability, more difficult to use and rather more likely to get out of order.

Ferguson's syringe, as we have noted, was originally designed for injecting vascular nevi with iron perchloride. The technique of treating these nevi by the injection of an irritating or even caustic solution came into prominence about 1836.[5] The use of iron perchloride for this purpose was introduced in 1853. The injections were made by first incising the skin with a lancet and then inserting the (blunt) tip of the syringe. As may be supposed, the treatment was not without peril, and met with a number of objections. Ferguson's syringe was designed, as the following account shows, to obviate some of these:

> During the last two months we have witnessed several trials of the acid solution of the perchloride of iron, as an injection for producing the coagulation of the blood in naevus, etc. In more than one instance, very severe inflammation of the part has followed its use, and in one, a naevus on the scalp, sloughing, and even exfoliation of a portion of bone resulted. There appeared, however, some reason to think, that the powerful agent had been too freely used, and that, had a much smaller quantity been injected, the promises made by its introducers might possibly have been borne out. Other objections also applied to the method and instruments in ordinary use; they required that an opening should be made for the introduction of the syringe; and the flow of blood produced by the puncture, to say nothing of the smallness of the aperture, sometimes rendered the latter difficult of accomplishment. We have been shown, during the past week, an ingenious little instrument contrived by Mr. Fergusson [*sic*], of Giltspur-street, which looks likely to aid very materially the efficient accomplishment of this procedure. It consists of a very small glass syringe, the point of which terminates in a fine platinum tube. This tube is encased in another one, about a quarter of an inch longer than the first, ending in a sharp trocar-like point, and having, near its extremity, an oblique opening in one side. By rotating the outer tube on the contained one, their apertures may be made to correspond or otherwise, at the will of the operator. Thus, then, the necessity for two instruments is quite done away with. The syringe having been charged, the operator rotates the outer tube, so as to conceal the orifice of the inner one entirely, and protect it from the ingress of blood. In this state the instrument is passed into the centre of the tumour, and, having been stirred about as

[5] Lloyd, E. A. Observations on the treatment of vascular naevi materni. *Lond. med. Gaz.*, 1836-1837, *19*, 13-22; Paget, T. Fatal convulsions during the injection of naevus. *Lond. med. Gaz.*, 1837-1838, *21*, 529-530; Fergusson, William. *A system of practical surgery*. London, 1842. 596 pp. (See p. 115.)

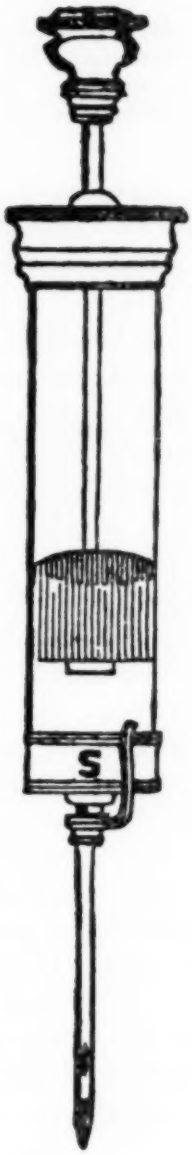

FIG. 1.

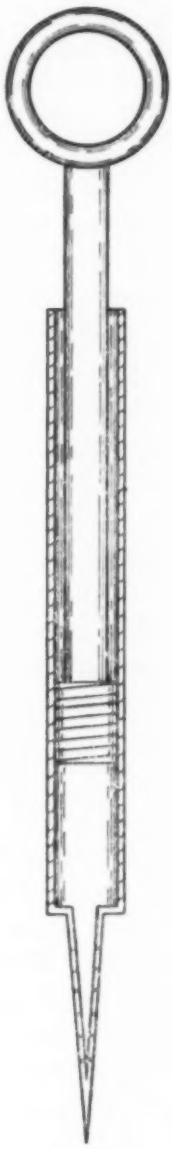

FIG. 2.

FIG. 1. Ferguson-Forster syringe (courtesy of National Library of Medicine).

FIG. 2. Zophar Jayne's syringe (copied from patent specifications, U. S. Patent Office library).

much as may be thought desirable, the tube is turned back, so as to expose the orifice; and the piston being at the same moment depressed, a drop or two of the solution is squeezed out. It may be supposed, that the smallness of the whole instrument, and the diminutive size and oblique position of its aperture, will afford considerable guarantee against the injection of too large a quantity, while on its advantages, in ease of employment, it is scarcely necessary to insist.[6]

Ferguson's original instrument was slightly modified by Cooper Forster, a London surgeon, who added indicators to show when the aperture was shut and when it was open. In this form it is illustrated in Figure 1.[7]

Ferguson's instrument, with its pointed needle, did away with the need for a separate trocar and canula or lancet, and it was certainly ingenious, but for ordinary injections unnecessarily complicated and, perhaps, traumatic. Wood, by simplifying the needle, made a valuable contribution to the development of the instrument in addition to his more significant work in introducing hypodermic injections.

Curiously, Ferguson was not in fact the first to devise a syringe with a pointed needle. In 1841, one Zophar Jayne, M.D., of Greene County, Illinois, received a patent for a syringe having an attached small, sharp, hollow "beak" with an opening on the side near the tip (Fig. 2). It was designed for treatment of reducible hernia by injection of an irritating liquid to produce adhesion between the inner surfaces of the hernial sac.[8] Jayne and his syringe appear to have received little notice, his desire to patent both instrument and process having perhaps helped to consign him to well-merited oblivion. A similar technique, recommended in 1844 by the Philadelphia surgeon Joseph Pancoast, received wider notice, but Pancoast used a trocar and canula with a small graduated syringe that could be fitted to the end of the canula after removal of the trocar.[9] Alexander Wood of Edinburgh remains as the effective originator not only of hypodermic medication, as Howard-

[6] Anon. New instrument for injecting the perchloride of iron in cases of naevus, etc. *Med. Times Gaz., Lond.*, 1853, *n.s.* 7, 219.

[7] Anon. Treatment of naevus by the injection of perchloride of iron. *Med. Times Gaz., Lond.*, 1853, *n.s.* 7, 654-655.

[8] U. S. Patent no. 2,032, issued 2 April 1841. Jayne's patent was noted by Archer, W. Harry. The history of anesthesia. *In:* Maryland State Dental Association. *Proceedings, dental centenary celebration*, Baltimore, 1940, pp. 333-363. (See p. 345.)

[9] Pancoast, Joseph. *A treatise on operative surgery*. Philadelphia, 1844. 380 pp. (See p. 283.) See also review of Pancoast in *Brit. foreign med. Rev.*, 1845, *20*, 39-58; Druitt, Robert. *The principles and practice of modern surgery*. Sargent, F. W., Ed. Philadelphia, 1848. 576 pp. (See pp. 440-441.)

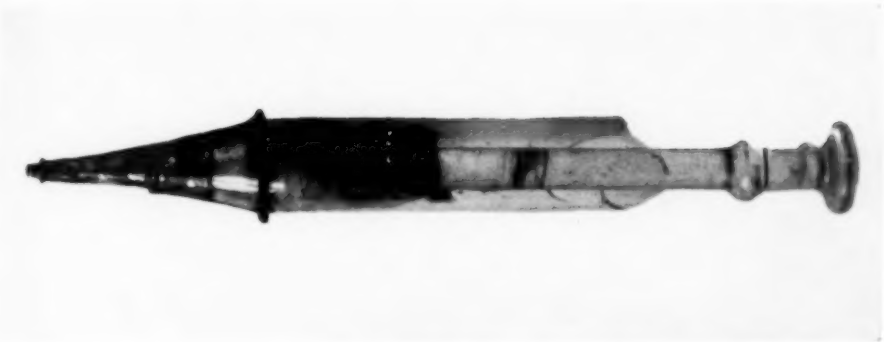

FIG. 3. Dr. Wood's syringe (courtesy of Royal College of Surgeons of Edinburgh).

Jones has shown, but also of a practical hypodermic syringe.[10] In the museum of the Royal College of Surgeons of Edinburgh is preserved what is said to be the original syringe of Dr. Alexander Wood.[11] Whether this conforms to the description of the Ferguson syringe cannot now be determined, since the needle has long since disappeared.

[10] The invention of the hypodermic syringe has also been attributed to A. Neuner. Anon. Famous firsts. *Ther. Notes, Detroit,* 1953, *60,* 233. Neuner's syringe, however, had an attached cannula with a pointed stylet running through the entire length of syringe and piston rod, with its sharp end extending about 2 mm. beyond the tip of the cannula. The stylet had to be removed before the contents of the syringe could be injected. The syringe was designed for injecting a small amount of an appropriate solution into the lens of a dead eye in order to form an artificial cataract for practising cataract operations. Neuner, A. Ueber die künstliche Erzeugung von Cataracten in todten Augen zum Behuf der leichteren Erlernung der Staaroperationem. *J. Chir. Augen-Heilkunde,* 1827, *10,* 480-492.

[11] Comrie, John D. *History of Scottish medicine.* 2d ed. 2 vols. London, 1932. (See 2, 614.)

Weights and Measures in Pre-Columbian America*

FRANCISCO GUERRA**

THE existence of a system of posology in the ancient cultures of the Old World has been widely established. Of particular interest to medicine is the study made by Leake (1952)[1] of quantitative measurement in therapeutics as in the Egyptian Papyri. Study of similar documents of the American aborigines, such as the *Badianus Codex* (1952),[2] has not revealed any reference to measurement by weight in the administration of pharmaceutical preparations prior to the arrival of the Spanish conquistadores. Even centuries after that event, the medical manuscripts of the Maya, such as the *Chilam Balam de Ixil,* use only vague quantitative measurements for doses—"a handful" of herbs and similar expressions. After analysing documents relating to taxation, such as the *Mendoza Codex,* historians have arrived at an idea of some units of measurement for certain goods and staple products which were to be part of the tribute due each year to the rulers.

In 1956, in the course of a search for manuscripts pertaining to American materia medica, an old anonymous manuscript dealing with the history of physical and biological sciences of the pre-Columbian period was discovered. This manuscript was identified as the work of Antonio de León y Gama (1735-1802), a Mexican scientist and author, who used the same codices and sources of information as Siguenza y Góngora, Boturini Benaduci, and other early historians of American antiquities. The manuscript of León y Gama (ca. 1790), transcribed in extenso and properly edited, with biographical and bibliographical notes, will appear elsewhere.[3] At this time only a short summary of the chapters on weights and measures is offered.

* This investigation was supported by United States Public Health Service Grant No. 6394 from the National Institutes of Health.

** Department of the History of Science and Medicine, Yale University School of Medicine.

1 Leake, Chauncey D. *The old Egyptian medical papyri.* Logan Clendening Lectures on the History and Philosophy of Medicine. Lawrence, Kansas, University of Kansas Press, 1952. [x], 108 pp.

2 Guerra, Francisco. *Libellus de medicinalibus Indorum herbis. El manuscrito pictorico mexicano latino de Martin de la Cruz y Juan Badiano de 1552.* Estudio, texto, y versión. México, Editorial Vargas Rea y El Diario Español, 1952. xii, 258 pp.

3 Guerra, Francisco and Guerra, Shirley M. J. de. A history of physical and biological science in pre-Columbian Mexico, by Antonio de León y Gama (1735-1802). [In preparation.]

In his second letter to Charles V, shortly after the conquest of Mexico in 1521, Hernan Cortés remarked that the Mexicans sold everything by number and measure but never by weight. Gómara mentioned that among the Chibcha on the coast of Cartagena some system of weighing was employed. A controversy arose over the statement of Francisco Pizarro, that in Tumbez, Perú, he had observed a Roman scale being used by the Inca to weigh gold: this record is now understood to refer to a European contrivance imported by the Spanish since no other example of such a scale has been discovered.

Furthermore, there is no word in the Nahuatl language for weight, and after the conquest of Mexico the Aztecs named the officer in charge of weighing the silver at the Mint *Tlatamachihuani,* meaning the one who measures. A system of standards for volume and length can be established in Nuclear America prior to the arrival of the Spaniards, and, though these standards are not as detailed as those of the Roman system, they seem to have been fairly widespread in their application.

In the *Mendoza Codex* there is a reference to the *Quauhchiquihuitl,* which was a wooden box like the Spanish *fanega* used for measuring corn and other dry goods. This box was divided in half, and then again until it reached one-twelfth part of the original amount, the smallest amount being named *Tlatamachihualoni.* The cocoa-bean, one of the most important products for tribute (for chocolate was a basic food), was measured in leather bags named *xiquipilli,* each of which held 8,000 beans; other larger bags were made of *iztli,* a fibre obtained from the *Agave Sp.* For smaller measures the Mexicans used the *xicalli,* a series of cups of varying size. The *xicalli* was used for measuring *copal,* a resin which was employed in religious rituals and which always appears in the lists of goods offered as tribute.

For measurement of liquids such as water, *atolli* (honey), or *actli* (oils), the Aztecs used jars of graded sizes; *hueycomitl* was the larger size, *xoctli* the medium, and *xoctontli* the small size. According to León y Gama, in the *tianguixtli* or open market, where these measures were in daily use, inspectors were appointed and were empowered to destroy faulty measures and to mark accurate measures with a seal.

Bernal Diaz del Castillo recounted that the Indians would carry gold, the most precious of their metals, in feather quills so that the gold-dust packed inside could be seen. These quills were used

in varying lengths to pay for blankets, cocoa, and other staples. León y Gama calculated the Aztec taxation in pre-Columbian times by the weight of gold in the special cups or *xicatontli* used for the purpose, and giving the equivalent value in Spanish ounces, *castellanos, tomines,* and grains.

Measurement of length was established by means of a stick called *Tlacaxilantli,* derived from *tlacatl* (man), and *xillantli* (navel); the length was therefore the distance from the navel to the ground in a man, which is very close to a yard, or three Spanish royal feet. From the evidence on some old pottery it is thought that the *tlacaxilantli* was divided in half and in fifths. The other measure was the *Tlalmecatl,* or string used to measure distance, and this was the equivalent of twenty *tlacaxilantli.* Greater distances were measured by *Netlalolli* or *Necchuilli,* which means the distance which could be covered by a running man at a stretch.

There are many pre-Columbian and Colonial codices prepared according to the aboriginal technique that offer information on weights and measures in America among the Indian cultures, particularly those on taxation and topography. A general study on their scientific value will soon be published. Among them, the *Codex Tecpan Caltitlan* ca. 1593—one of many dealing with property claims and hereditary genealogies—contains an Indian map of some properties where the land is measured by reference to a human femur, drawn in the upper left corner; this is the only case, so far known, of the femur being used as a measure of length.

Though these systems of weights and measures appear to be both complex and erratic, it should be borne in mind that by the use of these standards and a vigesimal system for arithmetical calculation, not only the Aztec, but also the Maya, Mixtec, Zapotec, Tarascan, and Otomi, which were the most notable cultural horizons in Central America, were able to settle trading problems and to organize a complex system of taxes and tributes.

The Technological Background of Physiological Discovery: Ballistics and the Graphic Method*

HEBBEL E. HOFF and L. A. GEDDES**

Introduction

THE weights and measures of daily life were the starting points in the evolution of the instruments for the measurement of dynamic processes in science and technology, and still serve as the fundamental basis for calibration. Their value in science is without measure, for as Kelvin wrote, "when you can measure what you are speaking about and express it in numbers, you know something about it, but when you cannot measure it, when you cannot express it in numbers, your knowledge of it is of a meagre kind."

In his *Idiota* of 1450, Nicolaus of Cusa insisted on an intimate relationship between the mind and the art of measurement, alluding to the similarity in their Latin terms when he wrote, "I for my part have a conception that the mind is the bond and measure of all things; and I conjecture it is called 'mens a mensurando,' the mind from measuring." Appropriately, he began the dialogue between the learned orator and the not-so-simple Idiot in the market-place:

Idiot: Because I told thee that wisdome cries out in the streets, and her cry is, that she dwells in the most high places, this now will I endeavor to shew thee. And first tell me what doest thou see here done in the market place?

Orator: I see in one place moneys telling, another wares aweighing, and over against us, oyle a measuring, and other things.

Idiot: These are the works of that reason, by which men excell beasts; for bruit beasts can neither number, weigh, nor measure."

It is appropriate, therefore, in this issue of the Journal, devoted to Dr. Kisch and his interest in weights and measures, to call attention to a phase in the evolution of the instruments of measurement in physiology, and in particular to the development of the art of graphic recording, that ingenious technological association of trans-

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ducer and reproducer by which a natural phenomenon so to speak writes out by itself an account of its own activities.

In 1847 Carl Ludwig[a] described how he connected the arterial system of a dog to a mercury manometer by fluid-filled tubing, translated the oscillations of the mercury column to a staff and stylus floating on the surface of the manometer, and brought the bobbing stylus against the rapidly moving surface of a smoked drum to obtain a graphic record of blood pressure as it varied with the animal's heart beat and breathing (Fig. 1).

The method was instantly successful; by its ability to write out for later analysis and truly objective description the operation of a wide spectrum of physiological functions, it quickly became the central support of physiological investigation and teaching. Indeed, the genealogy of practically every important center of physiological advance in the entire world passes through Ludwig's laboratory and is associated with exploitation of the graphic method. In other specialties of medicine, in the clinic as well as in the laboratory, the graphic method has participated importantly in the developments of the last century.

So truly monolithic has Ludwig's contribution to graphic recording become that it seems to have served as a reference point for all the further development and extensions of the method, and the very existence of any history of the method before Ludwig has been almost completely overlooked. We have become interested in this pre-Ludwig history from an attempt to understand something of the genealogy of discovery and the fundamentals of inventiveness; it seems to us to detract nothing from his unique position to find that Ludwig perceived the possibilities of graphic recording in physiology in prototypes in other areas of technology. To find, as we have done, Christopher Wren, Robert Hooke, Jacob Leupold, and others of no lesser stature in Ludwig's background[1] detracts no more from his genius than to encounter Albert De Saxe and Nicholas of Cusa in Leonardo da Vinci's.[2,3] Rather, it emphasizes the continuum of scientific thought and the many

[a] Son of an officer in the Napoleonic wars, Carl Ludwig was born in Germany in 1816, the second of six children. Receiving his M.D. from Marburg University at the age of 23 and remaining as instructor, it was toward the end of his appointment there that he invented the kymograph. Shortly afterward he was appointed professor of Physiology at Zurich; later he held the chair of Zoology and Physiology at Vienna. It was not until 1865, when he was 49, that he became director of his world-famed Institute for physiological research in Leipzig. Ludwig personally directed and participated in all research at the Institute for the next 30 years until his death. To physiologists his scientific contributions are well known, but he is even more renowned for pupils who passed through his Institute to become leaders in their own countries. The kymograph was first described in Müller's *Archiv für Anatomie, Physiologie, und Wissenschaftliche Medizin* in 1847.

minds, great and less great, that must labor on a single thought or instrument before it becomes clear and useful to all.[b]

Recently we have attempted to place in the perspective of history the events that immediately preceded and seem likely to have served as an impetus to Ludwig; they centered around the develop-

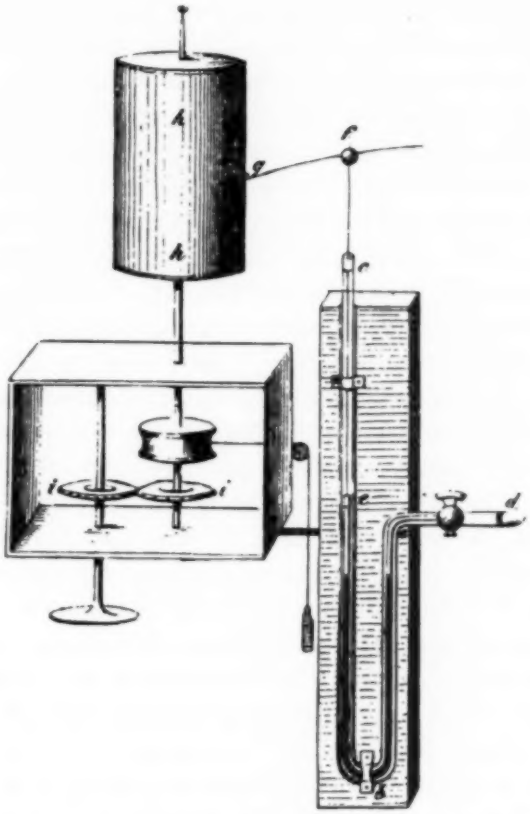

FIG. 1. Ludwig's kymograph, showing the revolving drum turned by clockwork powered by the falling weight, and the mercury manometer with its writing stylus.

ment of the ballistic galvanometer by Pouillet,[4] as a stage in the evolution of ballistics. This invention, adapting the principles of the ballistic pendulum to the galvanometer, and affording as it did a new and accurate means of measuring brief intervals of time, stimulated a renewed interest in ballistics even as it was applied to the propagation of the nerve impulse by Helmholtz[5,6] and to the analysis of the form of the alternating current wave by Lenz.[7,8]

[b] Another example of the working and reworking of a single theme is seen in the early history of the reflex. Cf. *J. Hist. Med.*, 1952, 7, 211-249.

The ballistic pendulum, invented nearly a hundred years earlier by Benjamin Robins (1707-1751), the English mathematician and engineer, was described in Robins' *New Principles in Gunnery*, first published in 1742. It determined the velocity of a projectile by direct application of Mariotte's fundamental formulation of the physics of impact or collision of elastic bodies. In this relation the product of mass and velocity (MV) remains constant whenever one body collides with another and imparts its energy to the second. If then a rapidly moving projectile of small mass strikes a pendulum of larger mass, it will impart a proportionally reduced velocity to the pendulum. This velocity can be calculated by the amount of angular, and hence vertical, displacement of the pendulum; knowing the relative masses of projectile and pendulum, the velocity of the former is readily calculated. Pouillet[c] perceived the analogy between the ballistic pendulum of Robins, translating the rapid motion of the projectile into the slow deviation of the pendulum, and the slowly responding galvanometer coil—10 to 60 seconds was the usual period of galvanometers in use at the time—by which the briefest of electrical impulses produced a galvanometer reflection lasting virtually thousands of times as long. When, then, currents of constant voltage were passed through the galvanometer circuits for various brief intervals from a rapidly spinning rheotome,[d] the angular deflection of the galvanometer became an index of the duration of current flow. The galvanometer thus calibrated, the same current was made and broken by a suitable circuitry laid out across the path of the projectile, and the velocity calculated by noting the deflection of the galvanometer when the weapon was fired and the current was caused to flow through the galvanometer during a measured portion of the bullet's flight.

[c] Pouillet, Claude Servais Mathias, French physicist, was born in 1790 and died in Paris in 1868. A graduate of the École Normale Supérieure, he became Professor of Physics at the College Bourbon and in 1821 Director of the Conservatory of Arts and Crafts. He also held chairs in physics at the École Polytechnic and at the Faculté des Sciences. A member of the Chamber of Deputies, he was active in deliberations relating to science and industry, railroads, the telegraph, coinage, and the postal system. He lost his post at Director of the Conservatory because of political ineptness in the upheavals of 1849, and later, refusing to swear allegiance to the Empire, he resigned his academic appointments. He was an elegant and clear lecturer and an ingenious and skillful experimentor. The study discussed here shows that he was one of the first to understand and analyze the limitations of scientific instruments. He was author of a famous textbook of physics.

[d] The rheotome, or current slicer, was an important tool of 19th century physics and physiology in which contacts on a rotating armature or disk provided electrical contact at selected periods of the cycle of rotation. Based essentially on the split-ring commutator of Page and named by Wheatstone, it was employed by Lenz to analyze the alternating current wave and by Bernstein to chart the action current of nerve. We have written an account of it in "The rheotome and its prehistory: a study in the historical interrelation of electrophysiology and electromechanics," *Bull. Hist. Med.*, 1957, *31*, 212-347.

Pouillet's method was of course a return to the direct method of Robert Hooke, who had attempted with indifferent success to measure the velocity of a missile by the rupture of threads stretched across its path, which in sequence started and stopped a pendulum.[4] Hooke had been diverted from his task, in part perhaps by technical difficulties, and had not returned to it, and not until the work of Pouillet nearly two hundred years later was a successful method described for timing an interval along the flight of a projectile.

Once Pouillet's method was published, it became apparent that others had been working with related techniques depending on graphic registration,[1] and the discussion thus evoked, largely in the *Comptes Rendus* of the French Académie des Sciences, seems likely to have been the direct stimulus to Ludwig. In the course of this exchange—it could hardly be termed a controversy—Poncelet, an important exponent of the graphic method especially in applied mechanics, was asked to reveal the sources of the method. He replied that the point of departure for his own work had been the "ingenious and early devices of Matthey, of Grosbert,[e] of Beaufoys, of Watt, and of Eytelwein."[9] Exploration of these sources revealed a background of ballistics in the graphic method, which is presented here in historical sequence.

Papacino D'Antoni and Mattei's Rotating Drum

Under two energetic and military dukes, the House of Savoy acquired in the first half of the 18th century the royal title of King of Sardinia and a foothold in the Piedmont of Italy, which it would later expand to the Kingdom of all Italy. In Turin were the royal military academies of artillery and fortifications; the Director of these academies was Papacino D'Antoni, Major General in the Sardinian Army, a student of military science and author of a remarkable series of military manuals. His *Treatise on Gun-powder* recounts, in addition to numerous experiments on the rate of burning of gunpowder and related topics, experiments on the velocity of projectiles. In these he acknowledged the priority of Benjamin Robins in the invention of the ballistic pendulum which he described and used.

Papacino D'Antoni's ballistic pendulum (Fig. 2) is notable for the method employed to determine its excursion. This Robins had ascertained by means of a ribbon pulled out through a light

[e] The names of Mattei and Grobert are misspelled here, presumably by the Academy secretary reporting Poncelet's verbal communication.

restraint as the pendulum swung under the impact of the bullet, while Papacino D'Antoni attached as a stylette to the lower edge of the pendulum and beneath it "placed a piece of wood cut in the arch of a circle, of which the circumference is described from the center C with a radius greater than CE; and in the plane of the vibration of the pendulum."[10] This stylette was arranged "to trace

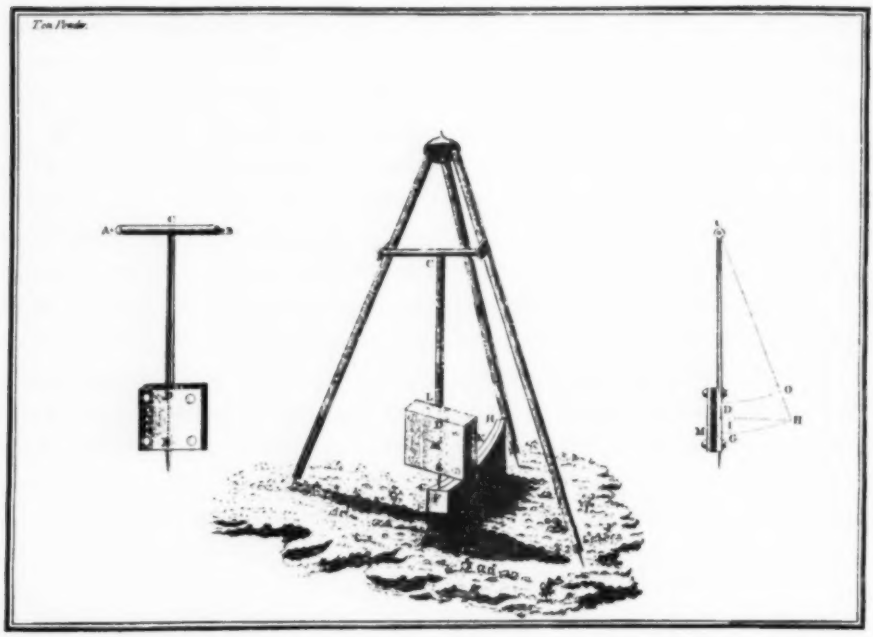

FIG. 2. Papacino D'Antoni's ballistic pendulum with stylette to mark extent of its excursion in dust coating the surface F-H.

up the fine dust, with which the circumference E K H is covered, the arch described by the first vibrations of the pendulum." We have found no earlier account than this of the use of a stylet to trace a record in dust or soot coating the recording surface, although there is reason to believe that the early seismographs in Italy were nothing more than suspended weights tracing their movements in the sand below or along a wall, by means of a similar stylette, and Papacino D'Antoni may well have copied from them.[11]

One of the difficulties in the employment of the ballistic pendulum had been apparent to Robins—it must not be placed too near the muzzle or the blast would add to the impact of the missile and augment the apparent velocity so measured. To avoid this source of error, Papacino D'Antoni employed an instrument in-

vented by the instrument-maker to the King, a Signor Mattei, which was essentially a rotating paper drum through which the missile was fired. Papacino D'Antoni described the instrument, (Fig. 3) and its use as follows:

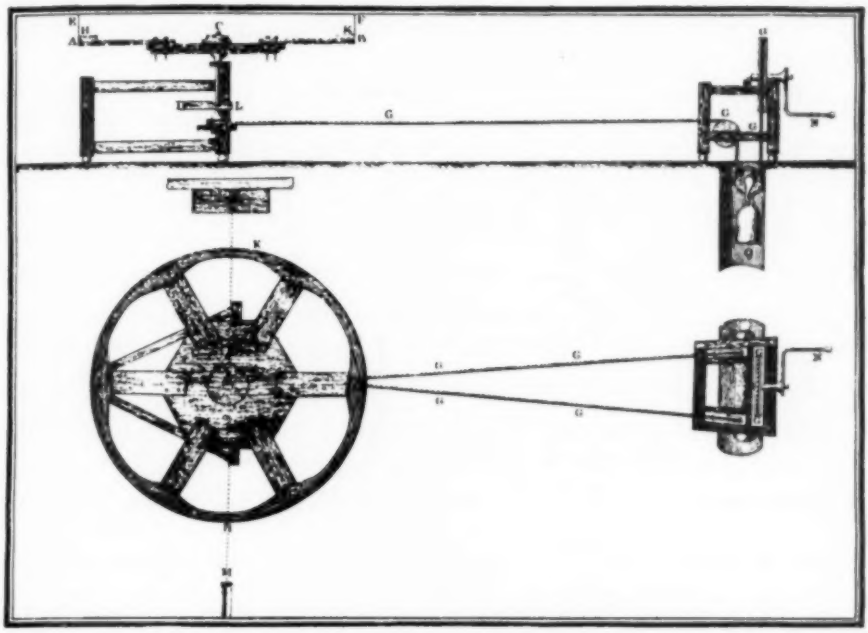

FIG. 3. Mattei's rotating drum for determining the velocity of a projectile.

AB is a horizontal wheel with a vertical axis CD turned by the weight Q, appending to the rope GG and raised by the winch N. It may be turned in any other manner, provided that its motion be perfectly uniform and rapid. AE, BF is a circular band of writing paper about 6 inches high, fixed round the circumference of the wheel. The gun for the experiment is immoveably fixed at 20 feet distance, and pointed so that the axis of the gun produced would pass through the points H, K, the exact diameter of the wheel. R is a block of wood placed two or three feet from the wheel to receive the balls; it is of elm, that the penetrations may be uniform.

In using this machine it is requisite to ascertain when the motion of the wheels is equable, and how long it takes in each revolution; for this purpose various expedients may be devised. At TURIN we fitted a little excentric wheel IL to the axis CD, which at each revolution gave a vibratory horizontal motion to a tongue of wood at the extremity of which appended a common pendulum that was shortened or lengthened till its vibrations were isochronous to those of the tongue:[f] the length of the pendulum will show

[f] Note the use of the principle of resonance. An almost identical technique was used by Kraus *et al.* in their resonating cardiotachometer in which a series of pendula was caused to vibrate by the radial pulse. The pendulum showing the maximum excursion coincided with the pulse rate (*Z. ges. exp. Med.*, 1926, *53*, 243-286).

how long the wheel is in making each revolution. So soon as the isochronism between the pendulum and the tongue is established, fire the gun and stop the wheel; the two holes made in the rim of the paper by the ball, will be easily distinguished from each other by the edges being turned to the point that the ball went out at. Stretch a thread in the direction MR, passing through the centre of the hole H where the ball entered the paper. The distance of the other hole K from the point B will then be known: this distance shows how much one point of the wheel turned while the shot was traversing the diameter AB.

If the mechanism and use of this machine be well understood, it will be easy to find the uniform velocity with which the shot passes through the diameter AB of the wheel, and consequently its uniform velocity during one second of time. Let D be the diameter of the wheel, C its circumference, t the time that the wheel takes to make one revolution, m the distance that a point of the circumference of the wheel turns, while the shot is traversing the diameter; then m:D::C: $\frac{CD}{m}$, the last term will express the space passed through by the shot with a uniform velocity during one revolution of the wheel: then expressing by u the space that the shot passed through with a uniform velocity in one second, or its initial velocity, t:1:: $\frac{CD}{m}$: $\frac{CD}{tm}$: the last term = u will express the velocity sought. With this machine, when the wheel turns with an equable motion, t = 4/5 of a second, D = 10 feet, and consequently C = $\frac{22 \times 10}{7}$; then substituting these values in the expression of the velocity, $\frac{CD}{tm}$ = u; if the value of m be the fraction of a foot, the velocity u will be expressed in feet. For instance, if m be found experimentally = ¼ of a foot, then 1,571 feet will be the value of u . . .

The following is a table of initial velocities deduced from experiments with a musquet 3 ft. 6 in. in length of bore, under three different states of the atmosphere.

Velocity Observed

The charge of powder was 7 drams.	Very moist weather	Under a mean state of the atmosphere	Very dry weather
	Feet	Feet	Feet
Common war powder	1392	1542	1618
Fine ditto	1569	1736	1829
Fowling ditto	1566	1703	1784
Fire-work ditto	1566	1706	1779

This ingenious adaptation of the graphic recording employed the very phenomenon under investigation—the flight of the bullet—to achieve the inscription on the moving paper. The technique has been used many times in physiology, as for example in the classical autophygmogram or haemautogram of Landois, in-

scribed by a fine jet of arterial blood striking the moving paper, which first gave direct proof that the dicrotic wave was not an instrumental artifact but a genuine component of the pulse wave (Fig. 4).

Auto-sphygmogram (Haemautogram) from posterior tibial artery of large dog. (Landois.) *p*, Primary wave: *d*, dicrotic wave.

FIG. 4. The "hemautogram" made by allowing a fine jet of blood from a severed small artery to play against a moving paper surface, showing that the dicrotic wave is a natural phenomenon and not an instrumental artifact.

THE CHRONOGAPHIC DRUM

It has been related elsewhere that the rotating drum, in a form almost exactly like that described by Ludwig two years later, turned up next in ballistics in the apparatus of Breguet[g, 12, 1] based

[g] Breguet, Louis François Clement. French instrument maker, was born in Paris in 1804 and died there in 1883. He was the grandson of Abraham Louis Breguet who founded the firm of which he became the head in 1833. He was educated as an apprentice watchmaker in Geneva and at the École Polytechnique. Under his direction the firm took a leading part in the manufacture of instruments applicable to the physical sciences and, especially in France, to the telegraph. He constructed an ink-writing, self-recording barometer in 1841 (*C. R. Acad. Sci. (Paris)*, 1841, *110*, 24).

apparently on a closely similar instrument of Wheatstone,[b] both having been constructed at the behest of a Russian Captain of Artillery, Konstantinoff, for the Russian government. According to Wheatstone's account[13,14] he had first employed

> a clock-movement, acting on an index-needle, which moved or stopped according as an electric-magnet acted on a piece of soft iron, attracting it when a current traversed the helix of the magnet, and abandoning it to itself when the current crossed, as in my electromagnetic telegraph, of which this invention may be considered as one of the variations. The duration of the current was then measured by the extent of the circle traversed by the hand of the chronoscope.
>
> A relation was established between the duration of the current and that of the movement of the projectile by the following means: a wooden ring embraced the mouth of a loaded gun, and a stretched wire connected the two opposite sides of this ring, thus passing in front of the mouth of the gun. At a proper distance, the target was erected and so arranged that the least motion given to it would establish a permanent contact between a little metal spring and another piece of metal. One of the extremities of the wire of the electro-magnet was attached to one of the poles of a small voltaic battery; to the other extremity of the electro-magnet were attached two wires, one of which communicated with the little spring of the target, and the other with one of the ends of the wire stretched before the mouth of the gun; from the other extremity of the voltaic battery two wires were also given off, one of which came to the piece of metal affixed to the target, and the other to the opposite extremity of the wire that passed in front of the gun. Thus, antecedently to the explosion of the gun, there was established between the gun and the target an uninterrupted circuit of wire of which the wire in front of the gun formed part. When once the target was struck by the bullet, the second circuit was complete; but during the passage of the projectile through the air, and during this time alone, both circuits were interrupted; and the duration of this interruption was indicated by the chronoscope.

Finding sources of error in the differing latencies of the mechanisms for making and breaking the current, Wheatstone arranged the circuits so that "instead of breaking the continuity of the circuit and re-establishing it immediately, as we have hitherto said, the electro-magnet is maintained *in equilibrio* by means of two equal and opposite currents; on interrupting the first circuit the equilibrium is destroyed, and on interrupting the second the current occasioned by the interruption of the equilibrium ceases."

By thus arranging for the successive breaking of two threads it became possible to return to a very close approximation of Hooke's original method.

[b] Wheatstone, Sir Charles (1802-1875), English inventor, is best known for his studies on electricity, particularly on measurement of electrical resistance. He was one of the early contributors to the telegraph, invented the stereoscope, and made early measurements on the velocity of electricity.

Two pendulums, one a half-second pendulum, and the other having a little more accelerated motion, are each maintained at the extremities of their arcs of oscillation by means of an electro-magnet. When the ball escapes from the gun, one of the pendulums is liberated, and when it breaks the wire of the frame, the other pendulum is also liberated. The number of oscillations of one of the pendulums is then counted, until the motion of the two pendulums coincides; and from this fact, the time which separates the commencement of the first oscillations of the two pendulums is easily calculated.

Finally Wheatstone came to the rotating drum, as follows:

A cylinder executes a rotary motion round a screw, so as to advance a quarter of an inch per revolution; to one of the extremities of the cylinder is adapted a toothed wheel of a diameter a little greater than that of the cylinder, and which communicates with a pinion whose length is equal to the total portion of the axis which the cylinder must pass over in its successive revolutions; this pinion communicates with a wheel work, put in motion by a weight suspended at the extremity of a wire winding around a cylinder, and the wheel work is furnished with a regulator which equalizes its motion; a pencil, adapted to the extremity of a small electro-magnet is brought into contact with the cylinder, and traces upon it a helix, which is interrupted every time that the current ceases. I borrowed the idea of the chronoscopic part of this apparatus from an instrument intended for measuring small intervals of time, invented by the late Dr. Young, and which is described and drawn in his Course on Natural Philosophy.

Young[i] described his rotating drum, which is illustrated in Figure 5, as follows:[15]

A chronometer may be constructed on this principle for measuring small portions of time which appears to be capable of greater accuracy than Mr. Whitehurst's apparatus, and by means of which an interval of a thousandth part of a second may possibly be rendered sensible. If two revolving pendulums be connected with a vertical axis in such a manner as to move two weights backwards and forwards accordingly as they fly off to a greater or smaller distance, the weights sliding, during their revolution, on a fixed surface, a small increase of velocity will considerably increase the distance of the weights from the axis, and consequently the effect of their friction, so that the machine will be immediately retarded, and its motion may thus be made extremely regular. It may be turned by a string coiled round the upper part, and this string may serve as a support to a barrel, sliding on a square part of the axis, which will consequently descend as it revolves. Its surface being smooth, it may be covered either with paper or with wax, and a pencil or a point of metal may be pressed against it by a fine spring so as to describe always a spiral line on the barrel, except when the spring is forced a little on one side by touching it slightly, either with the hand, or by means of any body of which the motion is to be examined, whether it be a falling weight, a vibrating cord or rod, or any other moving substance. In this manner, sup-

[i] Young, Thomas (1773-1829). English scientist and versatile genius. A precocious scholar, he read Latin, Greek, French, Italian, Hebrew, Persian, and Arabic at the age of 14. He was elected Fellow of the Royal Society at 21. He took a medical degree and practised medicine but becoming interested in physics, was named Professor of Physics at the Royal Institution in 1801. His lectures there, published in 1807, are those referred to by Wheatstone. He contributed importantly to physical optics and the theories of vision, establishment of longitude, life insurance, and Egyptology.

posing a barrel a foot in circumference to revolve in two seconds, each hundredth of an inch would correspond to the six hundredth part of a second; and the scale might be still further enlarged if it were necessary.

By means of this instrument we may measure without difficulty the frequency of the vibrations of sounding bodies by connecting them with a point

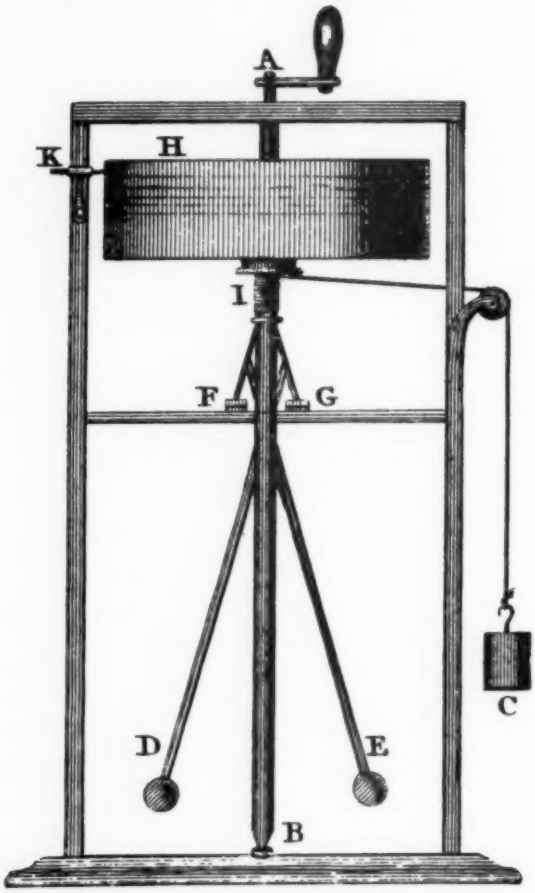

FIG. 5. Thomas Young's rotating drum chronograph.

which will describe an undulated path on the roller. These vibrations may also serve in a very simple manner for the measurement of the minutest intervals of time; for if a body, of which the vibrations are of a certain degree of frequency, be caused to vibrate during the revolution of an axis and to mark its vibrations on a roller, the traces will serve as a correct index of the time occupied by any part of a revolution, and the motion of any other body may be very accurately compared with the number of alternations marked in the same time by the vibrating body. For many purposes, the machine, if heavy enough, might be turned by a handle only, care being taken to keep the balls in a proper position, and it would be convenient to have the descent of the barrel regulated by the action of a screw, and capable of being suspended at pleasure.

It is obvious that all of the applications of the graphic method described here made use only of an on-off signal, indicating elapsed time. Exploitation of an autographic record to display not only time but also amplitude of an event had in fact been described somewhat earlier than the applications of Breguet, Wheatstone, and Young in an account by Eytelwein of a long-paper recording system.

Eytelwein and the Extension Drum

Johan Eytelwein (1764-1848), an artillery officer in the Prussian army who turned to civil engineering, made important contributions to the regulation of rivers, the design and construction of harbor installations, and participated in determining the boundaries of the Rhenish provinces and in establishing the Prussian weights and measures. He wrote extensively on mechanics, on the construction of fortifications, waterworks, breweries and distilleries; his many papers in the memoirs of the Berlin Academy are on applied mathematics. In the first years of the 18th century he became interested in the hydraulic ram newly invented by the Montgolfier brothers (1797), writing a monograph on the subject in 1805 which was translated into French in 1822.[16] This instrument operates by converting a portion of the inertia of flowing water at low pressure into flow of a lesser portion of water at greater pressure, and the transformation is effected in the hydraulic ram by the sudden closure of a waste valve, or arrest-plate.[j] Eytelwein became interested in the motion of this plate:

> The motion of the arrest-plate is so rapid that it is impossible to determine the time during which its orifice remains closed; and still less can one observe, without some sort of apparatus, if the movement of this arrest-plate is uniform or accelerated. It was thus necessary to invent an apparatus suitable to make perceptible the movement and the repose of the arrest-plate. To this effect a pencil was affixed horizontally in several experiments, above the top of the arrest-plate on the great ram, in such a manner that its point traced, on a sheet of paper that one brings up vertically during the play of the plate, a vertical line of a length equal to the amplitude of its opening.
>
> Let Fig. 25 A, B [Fig. 6] represent two cylinders of wood placed vertically, and surrounded by a strip of paper DB, very tight, arranged so that the cylinder B, turned by means of the crank C, causes the cylinder A to turn at the same time. Use of this instrument requires that the crank C be given a uniform movement which must be attained by experience and

[j] The arrest-plate, or waste valve, is so weighted that it remains open against the hydrostatic pressure in the system. When the flow of water past it attains a certain rate, the additional force of the moving water closes it suddenly and water enters the high-pressure system.

the use of a watch with a second hand. These dispositions made, as soon as the arrest-plate, armed with the pencil point adapted to it, is in motion, and the machine having returned to the state of rest, the band of paper is approached horizontally to the pencil point (as is shown in Fig. 25) while continuously and uniformly turning the crank. At the moment of beginning the experiment, the paper is brought up to the pencil, so that it can

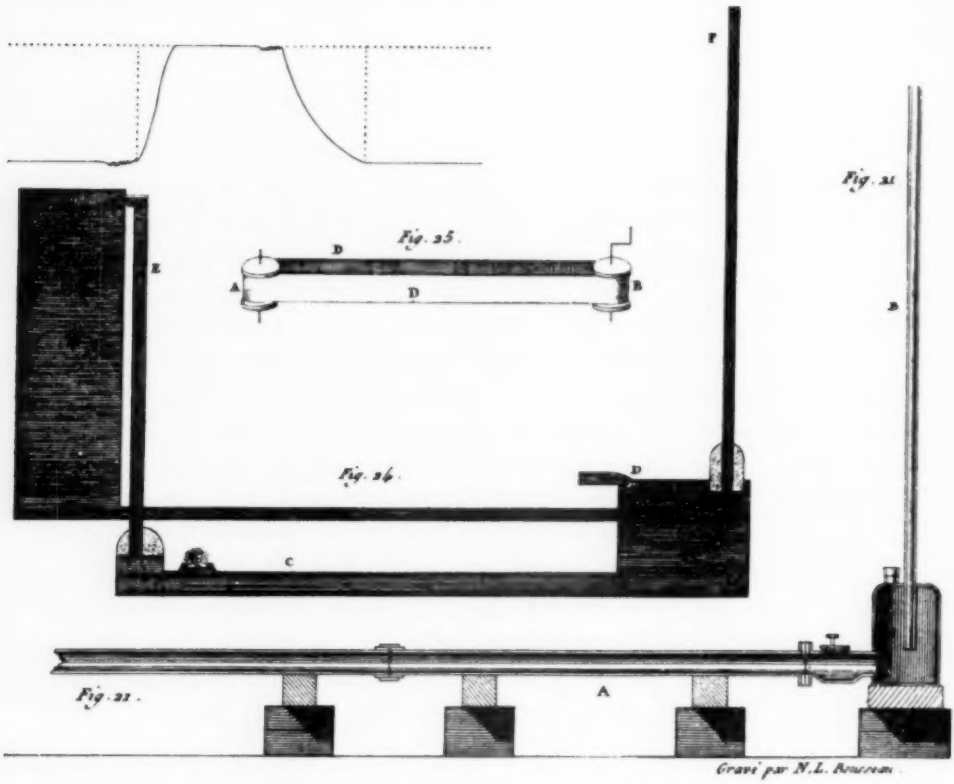

FIG. 6. Extension-paper drum of Eytelwein for registration of the excursions of the arrest-plate of the hydraulic ram, which is also shown schematically.

leave on the smooth band of paper light traces of its movement, in rising and falling. Thus one comes to know easily, with the aid of the time elapsing during the experiment, the duration of movement and arrest of the arrest-plate.

Figure 6 is a reproduction of Eytelwein's illustration; his Figure 25 is shown in the upper left. The record is read from right to left and depicts one cycle of operation of the arrest-plate. Figure 21 below shows a single-stage ram. Water normally flows out the opening at the top of the supply-pipe until a certain velocity is attained when this valve closes, whereupon a smaller proportion

of water enters the high pressure chamber. Above in Figure 24 is a double ram.

Eytelwein's studies are of historical importance apart from their contribution to the art of self-registration as an early example of the study of the opening and closure contours of valve action, so necessary to attain high efficiency.

Grobert's Rotating Disk Chronograph

The disadvantages of Mattei's rotating drum were many: the projectile had to be aimed with accuracy across the exact diameter of the drum, while the proper resolution of the displacement of the shot-holes required either a great speed of rotation or a drum of large diameter (Papacino D'Antoni's was 10 feet across). These defects were remedied in the apparatus of Grobert, described in 1804. Jacques François Louis Grobert, born in Algiers in 1757 and appointed Director of the Arsenal at Meulan in 1794, studied the design of gun-carriages and other technical subjects for the new Republic during the following ten years. In the course of these studies he devised a modification of Mattei's apparatus as follows:[17,18]

> A horizontal revolving axis, of about 34 decimeters in length, has at each of its extremities a disk or circle of pasteboard placed perpendicular to the axis, the centres of which are in the same axis, to which it is fastened in such a manner that the whole system can turn rapidly without the respective positions of its different parts being deranged.
>
> The rotary motion is communicated to the axis and to the disk by means of a weight suspended at the extremity of a rope, which, after passing over a pulley raised 10 or 12 yards above the ground, rolls itself round the arbor of a wheel and axle fixed at the same level as the disks. An endless chain, which passes round on the one side the wheel of the axle, and on the other a pulley fixed on the axis of the disks, transmit to that axis the motion which the weight communicates to the wheel and axle during its fall.
>
> This apparatus, as is seen, has the merit of being simple; and without entering into further details it may be readily conceived how it can be employed for measuring horizontal velocities. Let us suppose that the two disks are at rest, and that a ball traverses them in a direction parallel to the axis or the line passing through their centres: it is manifest that this axis will be in the same plane with the holes made in the disks; but if the disks turn around their axis while the ball passes from the one to the other, the plane containing the axis of rotation and the first hole will not coincide with the second hole; and if a second plane be made to pass through the second hole and the axis, the angle formed by these two planes will be the measure of the arc described by any point of the disks, while the ball or bullet passes over the interval by which they are separated.
>
> The question then is, to measure the velocity of the bullet.

1st, To impress an angular, uniform, and known velocity to the system of the axis and the two disks.

2d, To measure the arc comprehended between the two planes passing through the axis, and each of the holes or passages which the bullet has opened through the disks.

Then, to measure the arc passed over by the disks while the ball went from the one to the other, we placed before each of these disks a screen or fixed piece of pasteboard, which was at a very small distance from it; so that the ball during its passage first traversed the first screen, and these two holes were in the same straight line with that made in the second screen; a wire, directed horizontally through the centre of the latter hole, pierced the second disk; and the arc, having its centre in the axis of rotation comprehended between the extremity of that wire and the centre of the hole made by the ball in the second disk, gave the measure of the angle described by the system of the two disks, while the ball had passed over the length of the axis.

It may be readily seen that the fixed screens, which give the absolute direction of the ball in space, furnish the means of making an allowance for the want of parallelism, if there be any between that direction and the axis of rotation of the disks.

Careful attention was given to the resolution of the apparatus, required by the

enormous difference supposed to exist between the velocity of a projectile thrown from a cannon and the angular velocity that may be given to the disks.

It is concluded, indeed, from the experiments already known in regard to artillery, that the time employed by the ball or bullet in passing over the distance of three or four metres between the disks must be smaller than the hundredth part of a second, and it can hardly be conceived that during so short a time the disks can describe a sensible arc.

The solution of this difficulty is as follows: When the motion has become uniform, the wheel and axis make generally 0.833 turns per second, and the axis of the disks 7.875 turns, which thus made 6.56 turns per second correspond to each turn of that wheel: therefore a point placed on one disk at the distance of a metre from the axis passed over about 41 metres per second, which gives for 1-100th second 41 centimetres, a length more than sufficient to furnish very exact measures.

Here probably is the immediate stimulus to Morin's use of rotating disk chronographs which have been mentioned elsewhere,[1,8] and which served as the model for Pouillet's and later for Bernstein's rheotomes. Wheatstone's chronographic disk, reported above, is itself no doubt related to Grobert's, and even earlier, in 1822, Rieussec[19] patented a chronograph in which a dial was rotated by clockwork and received marks in ink when a button was pushed, thus to time the beginning and end of an event.

Beaufoy and the Time-Mark

From the above it is apparent that time was usually calculated from the observed rate of rotation of the drum or disk and its known diameter. Only in Young's chronograph was a separate time record made after the manner of Wertheim years later.[20] Apparently the first to put time signals directly on a record was Mark Beaufoy.[k] Interested in the resistance of water to bodies

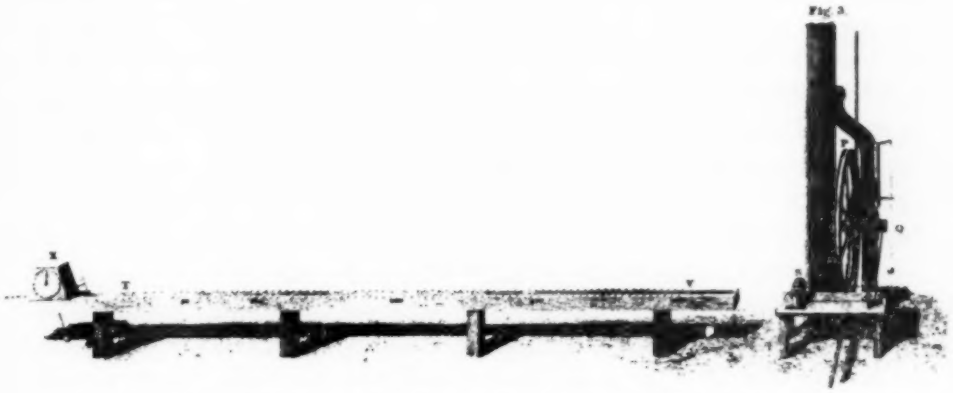

Fig. 7. Timing device of Mark Beaufoy. The slide T-V is drawn along at a rate proportional to a test block in a testing basin, and is marked off in seconds by a pencil operated by the clock X.

drawn through them as a necessary step in hull design, Beaufoy set up an apparatus by which a falling weight drew a wooden block of variable shape through the water, measuring its movement by a clock marking seconds with a pencil on a slide drawn past the pencil. Describing these experiments in 1815—they had been performed between 1793 and 1798—he wrote:

> Time was measured by means of a pendulum clock, to which there was attached a batten moving over a long horizontal frame accurately divided into parts, and by means of a spring a pencil-mark was left on the frame at the end of every second or interval required. By this peculiar contrivance it was found easy to divide a second into 1000 parts, and to determine the motion of the 1000th part of a second, a degree of precision never before attempted far less obtained in any similar experiments.

Figure 7 is a drawing of the apparatus, taken from Beaufoy's posthumous *Nautical and Hydraulical Experiments* edited by his son and published in 1834.[22]

[k] Mark Beaufoy (1764-1827) because interested in naval design because of the ascendancy of French design at that period and in 1791 founded a society for the improvement of naval architecture, "where theory should be founded on experiment." He wrote extensively on nautical and related matters; a short biography appears in Silliman's *American Journal of Science* (1835, *28*, 340-347).

CONCLUSION

We have yet to see the end of the age of mechanics, which had its origin in the School of Alexandria, if not long before, and was called by Leonardo da Vinci the "noblest and most useful science of all" (3, p. 455). Its practical applications, under the impetus of James Watt's perfection of the steam engine, produced the Industrial Age, while our present era of automation and atomic power, based on more complete liberation of energy and its more adequate control by electronics, simply re-emphasizes Leonardo da Vinci's affection for mechanics as "the veritable paradise of the mathematical sciences" (3, p. 455). In the whole sweep of the history of mechanics, ballistics has played no inconsiderable part; Leonardo da Vinci, Galileo, Boyle and Hooke, and Newton all dealt with it in one way or another, and today's scientists have been occupied with it no less importantly. During its history it has borrowed freely from other sciences and as freely given. An unexpected association has been uncovered with the instrumentation of physiology, which we have treated elsewhere as it relates to Helmholtz and the measurement of the velocity of nerve conduction and here as it has related to Ludwig and the development of graphic recording in physiology. These accounts illustrate that resourcefulness in methodology which is such a characteristic of the inventive mind, as well as the almost universal applicability of sound ideas.

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Amatus Lusitanus on Sudden Death Due to "Obstruction in the Heart" (1560)*

JOSHUA O. LEIBOWITZ**

THE newer knowledge of myocardial infarction looks back on a long and respectable pedigree. It is true that not until the work done by Obrastzoff and Strashesko[1] in 1910 and by Herrick[2] in 1912, was this disease established as a well-defined morbid entity. In spite of increased knowledge of the clinical signs and the additional laboratory aids—electrocardiograph,[3] white cell count,[4] and sedimentation rate[5]—it was not until the thirties that coronary occlusion became a lesion easily detectable by the medical profession.[6]

Yet the present awareness of and the familiarity with the signs and symptoms of coronary arteries disease stems from the long-continuing endeavours of previous generations which were not privileged to have the technical facilities of today. Since this paper bears on a Renaissance topic, only a few of the steps on the march to the recognition of coronary disease in the following centuries can be mentioned: William Harvey's two cases suggestive of myocardial infarction in his second letter to Riolan in 1649 with post-mortem findings and due recognition of the psychosomatic factor in one of them; Heberden's classical paper, purely clinical but unsurpassed; Morgagni's epistles 27 and 45; the brilliant contributions by Jenner, Fothergill, and others. Jenner's diagnosis of coronary disease in the case of John Hunter having been made in Hunter's lifetime and confirmed by autopsy; the regrettable suspension of further studies till the second half of the 19th century, excepting the beginnings of experimental ligation of the coronaries

* Sponsored by the Bezalel National Museum, Jerusalem, in honour of Dr. Bruno Kisch on the occasion of his 70th birthday.

1 Obrastzow, W. P. and Strashesko, N. D. Zur Kenntnis der Thrombose der Koronararterien des Herzens. *Z. klin. Med.*, 1910, *71*, 116. The Russian original reproduced (bibliography omitted) in *Klinitscheskaia Meditzina*, 1949, *27*, 15.

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3 Pardee, H. E. B. An electrocardiographic sign of coronary artery obstruction. *Arch. int. Med.*, 1920, *26*, 244.

4 Libman, E. Varieties and therapy of precordial pains due to organic cardiovascular disease. *Med. Rec. (N. Y.)*, 1916, *89*, 124.

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AMATI

LVSITANI

MEDICI PHYSICI

PRÆSTANTISSIMI

Curationum medicinalium,

CENTVRIÆ DVÆ,

QVINTA ET SEXTA.

In quarum vltima Curatione, continetur Colloquium eruditissimum: in quo doctissimè disputatur, & agitur de curandis capitis vulneribus.

Cum Indice omnium curationum, quæ ipsis Centuriis continentur. omnia nunc primùm in lucem edita.

LVGDVNI,

Apud Gulielmum Rouillium.

M. D. LXXX.

D. IOSEPHO NASSINIO, HEBRÆO, VIRO NON minus illustri, quàm sapienti.

AMATVS MEDICVS, S. P. D.

ENDAMNIS sub Paulo quarto, Ancona habitis, vt fortè nosti, Iosephe Nassini, omnium rerum mearum iacturam feci, & ne à suis commissarijs etiam opprimerer, Pisaurum primùm, inde Ragusium me subduxi. Vnde animo quietiori, quum malũ tantum memoriæ renocarem, inter tot, tantàque mihi subrepta, vt aurum, argẽtum, aulæos pãnos, preciosam vestem, & supellectilia non pauca, ac instru-

REuerendus Abbas, *ex Croma insula*, lapide vno vel altero à Ragusio distante, cùm rectè valeret, & alios alloqueretur homines repentè cor illi dolere, dixit, ac subitò supra cordis regionẽ admota manu, in terram, leuiter tamen concidit, omnibus repentè animæ facultatibus amissis, ad quem vocati, eum mortuũ esse diximus, deerãt autem non solùm in metacarpio & temporibus pulsus, sed supra cor etiam nullus percipiebatur motus. At, vt assistentibus satisfaceremus, ad nares accensam candelam admouimus, cuius flãma, nihil mouebatur, quin & speculum nitidum ori admotum fuit, & in eo nihil expirationis contracti visum est, sed & vitreum vasculum aquæ plenum supra thoracem applicauimus, & tamen aqua non mouebatur, tunc iussimus ad sequentem diem, cum inhumatum relinquerẽt, quòd si non potuisset, etiam ad tertium diem dimitterent, consului, quoniam, vt nostis, intra septuaginta & duas horas omnes motum suum complent humores, quæ horæ, tres designant dies.

SCOLIA.

Contradebant nonnulli abbatem hunc ex apoplexia obitum esse sortitum: sed re vera non sine errore, quoniã hic ex syncope, lancinato cordis, &

dissolutis spiritibus, à venenoso aliquo humore, diem suum obierit, vel potius in corde, obstructione aliqua parta, id quod nota ha attestantur, prima, quia ad cor doluit, & vt nosti ex Hippocrate, vbi dolor, ibi morbum dic, secundo, quia spuma nulla ad os referebatur, nulla oris distorsio, nulla membrorum retractio, immo ille os apertum ferè mansit, adeò vt dentes non claniculatos haberet, vt iure dicendum sit, nervis illasis, non ex apoplexia, sed magis ex corde primario affecto hunc subitò & repentè obijsse, quòd si quis nervos ad vim contenderit, in forti apoplexia omnimodam fieri membrorum dissolutionem, & non retractionem id quod nos diffitemur, tamen cum hoc fiãt velim, apoplexiam non fieri nisi offenso cerebro, & nervis, qui in hac violento & repentino obitu, non apparuerunt, proinde cum hic cor doluit, & nervi offensi non apparuerint, consentaneum magis videtur asseuerare, ex corde male affecto hunc obijsse, quam ex apoplexia.

FIG. 1 (*above*). Title-page and first page of dedication of the 5th and 6th centuriae of Amatus Lusitanus. Lyons, Rovillius, 1580 (in the writer's possession). FIG. 2 (*below*). The 62d "curatio" in the Lyons edition, 1580.

Fig. 3. From an engraving reproduced in Maximiano Lemos, *Amatus Lusitanus, A sua vida e a sua obra*, Porto, 1907.

Fig. 4. The Aesculapius column at the Rector's Palace in Dubrovnik.

by Erichsen; the neglect of coronary findings by R. Virchow who was the first to formulate the concept of embolism and infarction (lung, spleen, kidney); and the intensive studies at the end of the 19th century by Cohnheim, Weigert, Leyden, and René Marie.[7]

Realizing that four centuries following Renaissance medicine were necessary to establish our notion of coronary diseases, one should not expect to encounter too much convincing source material in 16th century literature. Though numerous references to states suggestive of coronary diseases are found, a rounded morbid entity does not emerge. Descriptions of precordial pain are not infrequent, sometimes accompanied by anatomical findings of hardened ("osseous") vessels and of indurations ("cartilaginous or tendinous") in the myocardium. A clinical state called in the older literature *lipothymia* is referred to and means a milder form of collapse and is, in the context, often suggestive of myocardial damage.

The difficult task of searching for clinical and pathological data in the 16th, as well as the 17th, centuries is much facilitated by the use of Théophile Bonet's *Sepulchretum*.[8] This bulky three-volume work, first published in 1679, is a compilation of some three thousand clinical and pathological observations gathered from antiquity to the end of the 17th century. The work can be regarded as a true precursor of Morgagni's *De causis et sedibus morborum* (1761), though the latter work surpasses it in sound correlation between the course of disease and the post-mortem findings, not to speak of Morgagni's own contributions to pathology. Both works contain many references to Renaissance medicine and can be used as guides to the sources of that period. For practical reasons, especially for quicker fact-finding, it appears most desirable to make available at the centers of medico-historical studies not only the original Latin editions, but also the old English translations—for Morgagni, Alexander's excellent rendering (1769),[9] and for Bonet, the very rare edition of 1684.[10] No modern

[7] No bibliographical references are given for the authors named in this and in the second paragraph of this paper; they can be easily located in J. B. Herrick's *Short history of cardiology*. Springfield, Ill., Charles C Thomas, 1942.

[8] Bonetus, Theophilus. *Sepulchretum sive anatomia practica, ex cadaveribus morbo denatis, editio altera, fecit J. J. Mangetus.* Lyons, Cramer et Perachon, 1700.

[9] Morgagni, J. B. *The seats and causes of diseases.* Trans. by Benjamin Alexander. London, Millar, 1769.

[10] Bonet, Th. *A guide to the practical physician . . . rendred into English with the subtraction of some things . . . and an addition of many considerable cases, etc.* London, for Thomas Flesher, 1684.

translation would reach the verbal or conceptual faithfulness to the original attained by those contemporary translators.

Incidentally, the case discussed in this paper is not referred to by Morgagni and Bonet. Nor is it mentioned in the standard works on Amatus Lusitanus, such as M. Salomon, M. Lemos, and H. Friedenwald, to which works the present writer had repeatedly expressed his appreciation, more recently in 1958 in the pages of this Journal.[11] The only reference to this case history of Amatus is that of Lavoslav Glesinger,[12] the competent Yugoslavian Amatus scholar, who makes a one-line comment on the case.

Before commenting on Amatus' case,[13] (Fig. 1) which seems to secure for him a respectable place in the early history of myocardial infarction, a slightly annotated translation of the case history which occurs in *Centuria* sexta (Fig. 2) may be given.

The sixty-second curatio treating of a sudden death occuring from a syncope and not from apoplexy

A reverend abbot from the Isle of Croma,[14] one or two miles distant from Ragusa, when he was in good health and talking to several persons, said that he suddenly felt pain in his heart and, with his hand moved rapidly toward the region of the heart, he fell, though slowly, to the earth and rapidly lost all his animal faculties. When called in I said he was dead. Not only was the pulse at the metacarpium and the temples missing, but even no motion upon the heart could be perceived. In order to satisfy the assistants I brought to the nostrils a burning candle whose flame did not move at all. Also a bright mirror was advanced near the mouth and nothing of respiratory contraction was seen on it. We then applied a glass vessel filled with water upon the thorax but the water was unmoved.[15] Thereupon I ordered to keep him unburied until the next day; and if nothing happened, I advised to dismiss him till the third day, since, as you know, the humors complete their motion within seventy-two hours which denotes three days.[16]

11 Leibowitz, J. O. Amatus Lusitanus and the obturator in cleft palates. *J. Hist. Med.*, 1958, *13*, 492-503 (see pp. 494-495).

12 Glesinger, L. *Amatus Lusitanus i njegov lijecnicki rad u Dubrovniku.* [Amatus Lusitanus and his medical activity at Dubrovnik], Zagreb and Belgrade, 1940, p. 61.

13 Amatus *Lusitanus. Curationum medicinalium centuria sexta.* Venice, Valgrisius, 1560. Edition used: Lyons, Rovillius, 1580.

14 Glesinger, *op. cit.*, p. 61, gives the modern transcription Lokrum; the spelling in Italian is Lacroma—island of tears. Some small islands off Ragusa are remembered in medical history. Probably the first recorded quarantine, in 1377, was established on one of them, when plague-stricken people were sent to the neighbouring island Zuppana, more to the north of Ragusa. (See Sarton, *Introduction to the History of Science*, vol. III, p. 1659, note 21.) See also: Grmek, M. D. Quarantäne in Dubrovnik. *Ciba Symposium*, 1959, *7*, 30-33.

15 This report depicts the measures for ascertaining death as taken in the Renaissance period.

16 This is an Hippocratic notion. Cf. the Littré edition, vol. VII, p. 567, §44, where the duration of the body humors' stay is being discussed to the effect that humors remain three days in the body during digestive processes. It was assumed that under normal conditions the humors completed their movement from one organ to another in the time span of three days.

Scholia

Some people contended that this abbot met his death from apoplexy,[17] but verily not without error, since this [man] ended his days due to syncope, his heart lancinated, and his spirits dissolved, either through some venomous humor or, to be more precise, through obstruction of some part of the heart which is attested by the following signs. First, because he had pain in the heart and as you know from Hippocrates:[18] where the pain, say [there is] the disease. Secondly, since no froth was brought to the mouth, nor was there any distortion of the mouth or retraction of the limbs. The mouth even remained almost opened, so that he had his teeth not tightly closed. Therefore it may be rightly and with greater probability asserted that, his nerves being without lesion, he died not from apoplexy, but suddenly and unexpectedly from a primarily affected heart. If somebody contends this comes from the nerves and he supposes that in a vehement apoplexy some kind of dissolution of the limbs may occur without retraction (an assertion which we contest) then he may be aware that an apoplexy cannot supervene without lesion of the brain and the nerves, which in this violent and sudden death did not appear. Therefore, since this [man] suffered from pain in the heart, and no damage of the nerves became visible, it seems to me more plausible that he died from a badly damaged heart than from apoplexy.

This account seems to be one of the earliest to depict the clinical picture of sudden death due to myocardial infarction. The case history is brief, impressive, and to the point. The chest pain is described verbally by the patient and illustrated by the typical movement of his hand towards the region of the heart. No postmortem examination is described, just as Heberden did not corroborate his findings by obductions. Heberden did not even make an attempt at the localisation and did not refer to the heart as the possible seat of the disorder. Amatus did not prove his assumption as to the localisation of the event in the heart. However, his sound reasoning appears very remarkable, when we read his Scholia (discussion, comment). A few points of the Scholia may be stressed: (i) "His heart lacinated" (*lancinato corde*), or lacerated, which could have a figurative as well as an anatomical meaning; (ii) "through obstruction of some part of the heart" *(in corde obstructione aliqua parta),* a very significant expression, calling to mind our use of the term occlusion, but derived no doubt from the Hippocratic-Galenical terminology; (iii) "primarily affected heart" *(ex corde primario affecto),* a successful and well-reasoned attempt at nosological classification.

17 As late as 1882 Karl Huber, collaborator of Carl Weigert in Berlin, described cases of myocardial damage which had been diagnosed as cases of cerebral apoplexy without anatomical findings in the brain. (Ueber den Einfluss der Kranzarterienerkrankungen auf das Herz und die chronische Myocarditis. *Virchow's Arch. path. Anat.*, 1882, *89*, 236.)

18 For instance Aphor. IV, 33, though in a different context: "But if previous to an illness a part be in a state of pain, the disease settles in that part"; cf. also Aphor. IV, 38, 39.

To produce the proper historical setting for Amatus' impressive description the first step must be directed to the genius of that period, Leonardo da Vinci. This artist-anatomist was perhaps the first to describe and to depict arteriosclerotic changes of the vessels and to stress the insufficient blood supply "to the heart and the other lower members." Elmer Belt[19] gave an admirable account of this passage in Leonardo's legends to his drawings. Though Leonardo produced beautiful pictures of the coronary vessels, he did not mean the coronary vessels when he spoke of "feeding the heart," since the context "and the other lower members" implies more the aorta. At any rate there could have been no influence on Renaissance medicine of any moment since the drawings were brought to the attention of the medical profession only in 1788 by William Hunter; they also appeared in part in 1796.

Benivieni's[20] often quoted case 35 is not convincing, the anatomical finding being a blood clot in the right atrium, a post-mortem artifact. The other Renaissance authors quoted by Bonet under the heading "Sudden death" (*mors repentina*) are not convincing either; in some of them no pain was described, in others, the anatomy did not conform to the usual pathology of the myocardial infarction. Amatus' case, though purely clinical and lacking post-mortem evidence, appears in comparison a classic in the history of coronary occlusion.

ADDENDA

Amatus' Portrait and a Biographical Note

The portrait reproduced in this paper (Fig. 3) seems to be the only one extant, at least no other could be traced by the present writer. It was not incorporated in any book but printed as a single sheet. It was reproduced by the distinguished Portuguese historian Maximiano Lemos; the same sheet is to be found also in the Friedenwald collection bequeathed to the Hebrew University, Jerusalem. Unfortunately, most portraits of physicians of the 16th and 17th centuries are conventional and do not reveal much of the character and life history of the persons they depict. Vesalius' portrait is an exception and I would add another, of the year 1628,

19 Belt, E. *Leonardo the anatomist.* Laurence, University of Kansas Press, 1955 (see p. 27).

20 Benivieni, A. *De abditis nonnullis ac mirandis morborum et sanationum causis.* Trans. by Charles Singer. Springfield, Ill., Charles C Thomas, 1954.

representing the Jewish physician Joseph Salomon Delmedigo produced by the famous Dutch artists Duyster (design) and Delff (etching), both contemporaries of Rembrandt.[21] Delmedigo appears alive in the portrait and narrates the full story of his life. Even the portraiture of William Harvey is marred by conventionalism, except for the forgotten family portrait discovered by Sir Geoffrey Keynes.[22] The one of Amatus is technically fairly adequate but does not yield much information about his joys and sorrows.

Amatus Lusitanus (1511-1568) was born in Portugal of Jewish parents; Neo-Christians by forced baptism. His name Roderigo de Castelbranco he changed to a latinized form according to Renaissance fashion, as did also Jacobus Sylvius (Dubois), Agricola (Bauer), and many others. After completing his studies at the famous University of Salamanca, he practised at Lisbon but moved about 1533 to Antwerp. Dr. José Lopes Dias of Castelbranco, himself an assiduous Amatus scholar, was so kind as to translate[23] my French essay on Amatus[24] and to comment upon it. He revealed that no mention of persecution was found in the archives, so that Amatus' leaving his native country may have been motivated by his wish for further increase of his medical knowledge. Scholars who left Central Europe some 27 years ago for a free country will better understand the motives of their Renaissance colleague. The first book by Amatus, *Index Dioscoridis,* Antwerp 1536, bears the name of its author as Ioannus Rodericus, while the following books, *In Dioscoridis. . .Enarrationes,* Venice 1553 (five editions) and all the Centurias (1551-1566), were signed with his adopted name. Friedenwald, in 1937, lists 23 editions of the Centuriae, and more have become known since then. Seven years of successful practice at Antwerp were superseded by seven Italian years (Ferrara, Ancona, and Pesaro). At Ferrara, Amatus held a teaching position at the University. After persecution at Ancona he left for Ragusa (1556-1558), and from there for Salonica, where he publicly embraced Judaism and died while giving medical aid to plague patients in 1568. His ethical oath is appended to his 6th and 7th Centuriae.

21 Reproduced on page 1895 in: Francesco, G. de. Das Arztportrait. *Ciba Z.*, 1938, *5*, 1886-1914.

22 Keynes, G. *The personality of William Harvey.* Cambridge, at the University Press, 1949 (see pp. 24-26).

23 Lopes Dias, José. Ensaio do Dr. J. O. Leibowitz sobre Amatus Lusitanus. *Imprensa médica (Lisbon),* 1952, 18 pp.

24 Leibowitz, J. O. Amatus Lusitanus. *Rev. Hist. Méd. Hébr.,* Juillet 1952, pp. 77-90.

To return to the portrait, experts are of the opinion that it must have been drawn (after a lost original?) in the 17th century, while the German legend presents characteristics typical of the 17th as well as the 18th century.

The Aesulapius column

This column is reproduced (Fig. 4) to show a specimen of Renaissance Ragusa, where Amatus lived about 20 months. The column is a fine specimen of art of the period with a richly elaborated chapter and a fine sculptured group. The column is a part of the Rector's Palace (rector is a title analogous to that of a Venetion Doge who was elected for a period of two years by the Ragusian noblemen's republic). Though Ragusa suffered an earthquake in 1667, the fine pillar remained undamaged. The name Aesculapius Column is of more recent origin, about the beginning of the 19th century when Epidaurum, 20 kilometres southeast from Ragusa, was confounded with Epidaurus of old Greek Aesculapius fame. The distinguished scholar Petar Budmani (1835-1914) disclosed this mistake. A supposition prevailed among the learned of Ragusa that the figure at the right might represent Amatus. They supported their view by the resemblance (?) of the face to the known portrait of Amatus, and by the fact that no other physician lived at Ragusa who devoted so much attention to materia medica as he did. At any rate, the group represents a medical or an apothecary scene. The details—teaching attitude with the left hand on the pulpit, the medicine pots, the distilling apparatus—are self-explanatory.

The 1580 edition of the 6th Centuria

This edition (see Fig. 1) has been chosen for illustration, since the first one of 1560 has already been reproduced by the present author.[25] It is of some interest to have before one's eyes also the fine Lyons print of this small book. Likewise interesting is the dedication of the Centuriae in this edition to a Jewish nobleman Don Joseph Nassi, Duke of Naxos (1515-1579). While the former centuriae had been dedicated to high persons of Christian church and court, Amatus feels himself free to address his opus to his co-religionist. He now publicly paid homage to this Maecenas family whose clandestine friendship he enjoyed during their common stay at Antwerp.

[25] Cf. note 11 (p. 497).

This paper describing a cardiological item, brought for the first time to the attention of the profession, together with a moderate dose of historical detail, and a few pencil strokes of art and archeology, a glimpse into a life laden with dangers and devoted to ancestral religious tradition, is appropriately dedicated to Dr. Bruno Kisch on the occasion of his 70th birthday.

Les Progrès de la Précision des Mesures

Vue Brève sur Leur Évolution

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LE métrologiste qui s'intéresse aux origines et à l'évolution de la métrologie, constate, non sans étonnement, que dans leur grande majorité, les nombreux travaux publiés au cours des cinq derniers siècles sur l'histoire de cette science des mesures, présentent une regrettable lacune: à savoir, l'absence très fréquente d'études précises consacrées aux aspects techniques de la métrologie. Or, parmi les nombreux problèmes qui se posent au métrologiste historien, celui de la précision des mesures se place au premier plan. Sa résolution étant étroitement liée à la connaissance des anciennes techniques de fabrication et d'étalonnage, il est donc indispensable de se livrer à des recherches approfondies, d'ailleurs délicates et ardues, dans le dessein de mettre en lumière les procédés qui furent autrefois en usage dans les ateliers de fabrication.

Les difficultés éprouvées au cours de telles recherches—nous les connaissons par expérience—justifieraient, tout au moins dans une certaine mesure, le mince intérêt que des historiens de la métrologie ont porté à ces questions techniques. Et d'ailleurs, pour en comprendre l'articulation, le métrologiste, rompu aux disciplines de sa science expérimentale par une longue pratique, est sans doute le plus qualifié. Il peut avoir des vues d'ensemble qui lui suggèrent des rapprochements et des analogies dans le temps et dans l'espace, mais qui échapperaient vraisemblablement à l'historien non spécialisé en ce domaine. Aussi bien, les obstacles qui surgissent dès qu'on aborde les aspects techniques de l'histoire de la métrologie, ne peuvent être surmontés, au moins partiellement, qu'après une étude métrologique systématique des spécimens, poids, mesures, etc. . ., qui ont franchi le temps sans trop de dommage.

Nous avons déjà tracé le plan directeur de ces travaux et justifié leur efficacité[1] en montrant le parti qu'il est possible de tirer de

* Paris, France.

[1] Machabey, Armand, Jr. *Les sources historiques de la métrologie. Rev. Métrol. prat. lég.*, 1952, pp. 165-180; Machabey, Armand, Jr. *La métrologie dans les musées de province et sa contribution à l'histoire des poids et des mesures en France, depuis le XIII^e siècle.* (Thèse principale de Doctorat, Université de Paris.) Paris, 1959.

l'exploitation scientifique des résultats expérimentaux et de l'examen approfondi des textes documentaires (lorsqu'ils existent). Cela dit, abordons quelques étapes de l'évolution historique de la métrologie, avant de prendre contact avec la période contemporaine.

Dès à présent, il convient de souligner le fait que les mesures dimensionnelles, jouant un rôle fondamental en métrologie et dans la plupart des activités humaines, ce sont plus spécialement les mesures de longueur, qui serviront de support à notre étude. Ainsi, prenons l'un des plus anciens exemples, celui du système de mesure suméro-babylonien. On constate que l'unité de mesure de longueur la coudée—d'à peu près 0.50[2]—est à la base de l'ensemble du système de mesure. C'est ce que M. Thureau Dangin a démontré, en soulignant le fait que la mesure de capacité, le *qa* de 0,84 1, équivaut à la cent quarante quatrième partie de la coudée cube, et que l'unité de mesure de masse, la *mine* équivaut au poids d'un volume d'eau égal à la deux cent quarantième partie de cette coudée cube, soit environ 505 g.[3] Ce système de mesure "fermé", ajusté à la numération à base sexagésimale, se prêtait aisément à la décimalisation, d'ailleurs en usage dans les opérations courantes.

Il est intéressant de noter que ces lointaines civilisations n'ignoraient pas la "normalisation", puisque des briques carrées babyloniennes semblent avoir été dimensionnnées à environ un pied babylonien.[4] En Egypte pendant la période héllenistique, et à l'image de nos techniques modernes, les formats du papyrus étaient fixés par un réglement.[5] De même les aires qui, dans les Nomes, étaient réservées aux cultures oléagineuses, devaient avoir une étendue que déterminait la réglementation.[6] Dans ce domaine de la normalisation, citons encore, mais cette fois plus proche de notre époque, l'arsenal de Venise. Avec ses seize mille ouvriers, il pouvait, vers la fin du XIV° siècle, sortir de ses chantiers une galère par jour, construite par assemblage de pièces préfabriquées, donc "dimensionnées."[7] C'est là un brillant exemple du véritable travail en série qui, de toute évidence, suppose qu'un certain

2 Taton, R. *Histoire générale des sciences.* Tome I. *La science antique et médiévale.* Paris, Presses Universitaires de France, 1957. 627 pp., illus. (Voir p. 107.)

3 *Ibid.*

4 Delaporte, L. *La Mésopotamie. Les civilisations babylonienne et assyrienne.* Paris, Renaissance du Livre, 1923. 424 pp., illus.

5 Toutain, J. *L'économie antique.* Paris, Renaissance du Livre, 1927 439 pp.

6 *Ibid.*

7 Thiriet, Freddy. *Histoire de Venise.* (Paris, Presses Universitaires de France, 1952. 128 pp.

degré de précision pouvait et devait être atteint dans la fabrication des différents élêments.

Précisément, la navigation et l'astronomie offrent d'intéressants exemples des efforts qui ont été produits dans le dessein d'accrôitre la précision des mesures de certaines grandeurs physiques.

La mesure des angles et la division des limbes préoccupent les techniciens au moins vers la fin du XV° siècle. A cette époque, la précision des mesures d'angles était de l'ordre de 10 à 15 mn. sur des cercles d'un rayon de 2,50 m (cas du quart de cercle de Tycho Brahe [1546-1601] par exemple). Le célèbre astronome eut l'idée de diviser le degré d'angle en six parties égales et de tracer des transversals rectilignes entre deux divisions consécutives, puis de subdiviser les transversals en huit intervalles égaux. Ceci lui permit de faire ses visées à une demi minute près, sinon à quart de minute près.

Dans le même ordre d'idées, le mathématicien portugais, Nuñez (1492-1577) publia en 1542 son procédé de subdivision par des arcs de cercle concentriques. Toutefois il fallait, après avoir lu le résultat de la mesure sur l'instrument, recourir à une table qui donnait la valeur des angles à une tierce près ; cette précision était dépourvue de sens, car l'erreur de lecture sur le limbe était inférieure à l'erreur de visée.[8]

C'est au franc-comtois Pierre Vernier (1580-1637) que la science doit le procédé auquel son nom est attaché.[9] Sa diffusion demanda un certain temps, mais on sait que l'opticien anglais Hadley fabriqua, dans la première moitié du XVIII° siècle, des octants qui étaient pourvus d'un "vernier."

Bien que le vernier permette, théoriquement, d'atteindre une précision illimitée, celle-ci est cependant bornée par un fait matériel : l'épaisseur des traits qui perturbe la lecture. Hors d'une certaine limite, plusieurs divisions successives du vernier paraissent coïncider avec celles de la règle (ou de l'arc de cercle). Il en résulte une grande incertitude sur le résultat de la mesure. Cet exemple prouve que, pour obtenir un gain de précision dans le domaine du mesurage, il y a lieu au préalable de concevoir des procédés techniques adaptés aux expériences, à la nature des

8 *Léonard de Vinci et l'expérience scientifique au XVI^e siècle.* Paris, Presses Universitaires de France, 1953. 273 pp., illus.

9 Vernier, Pierre. *La construction, l'usage et les propriétés du quadrant nouveau de mathématique. . . .* Bruxelles, 1631. 122 pp.

grandeurs à mesurer et qui offrent la possibilité de dilater l'échelle d'observation.

Les progrès de l'optique, notamment aux XVII° et XVIII° siècles, qui ont contribué à l'amélioration qualitative des nouveaux instruments d'observation—lunette astronomique, télescope, microscope—ont permis aux savants d'élargir précisément leur champ d'observation dans les univers macroscopique et microscopique.

Encore ne suffisait-il pas d'avoir un champ plus vaste, mais fallait-il mesurer ce qu'on voyait. Le principe du micromètre à fil mobile, auquel est lié le nom du mathématicien français Auzot (1630-1691) amorça des méthodes de mesure d'une précision élevée.

En tirant parti de la vis associée à un fil réticulaire,[10] Auzout préparait—sans le savoir—un terrain propice à l'invention du français Palmer qui, au XIX° siècle, se voit délivrer un brevet d'invention (n° 7518 du 7 septembre 1948) pour la création d'un "Calibre à vis micrométrique et vernier circulaire."[11] Cet instrument, universellement employé, permet d'obtenir une précision de l'ordre du centième de millimètre. Cet accroissement est considérable comparé aux limites plus modestes (2 à 4 dixièmes de millimètre) à l'intérieur desquelles devaient se cantonner les savants et les techniciens des XVI° et XVII° siècles.

Tournons nous à présent vers la mesure de la température, grandeur dite du type "repérable." Avant de "repérer" des variations de la température, il fallait créer un instrument capable de les mettre en évidence. Celui-ci apparait vers la fin du XVI° siècle, sous le nom de thermoscope (à eau). A partir de cette époque, plus d'un siècle s'écoulera avant que le "thermomètre" ne devienne un instrument de mesure acceptable (thermomètres de Fahrenheit, Réaumur, etc.). Cette invention marque une étape si importante dans l'histoire de la métrologie et de celle des sciences et des techniques, qu'il parait superflu d'en souligner l'intérêt. Au début, l'échelle du thermoscope a été graduée empiriquement, suivant cette tendance naturelle qui consiste généralement à tracer des divisions équidistantes.

Dès 1626, le physicien flamand Isaac Beeckman[12] s'éleva contre ce tracé, car il avait constaté expérimentalement que, sous l'influ-

10 Bion, Nicolas (Ingénieur du Roi). *Traité de la construction et des principaux usages des instruments de mathématique.* 4. éd. Paris, 1751. 448 p.

11 France. Ministère de l'Industrie et du Commerce. *Brevets d'invention français: 1791-1902. Un siècle de progrès techniques.* Paris, 1958. 320 pp., illus.

12 Mersenne, Marin. *Correspondance.* Tome II, 1628-1630. Paris, Presses Universitaires de France, 1945. 705 pp.

ence de l'élévation de la température, la montée ou la descente de l'eau ne varie pas proportionnellement à celle-ci.

Vers 1632 Jean Rey[13] réalise un thermomètre composé d'un long tube de très faible diamètre, soudé à la boule, mais non scellé à sa partie supérieure. Il s'en suivait que l'amplitude des variations du niveau de l'eau était plus grande que dans le thermoscope—ce qui, en langage métrologique, signifie que Jean Rey était parvenu à augmenter la "sensibilité" de l'instrument.

De son côté, Joachim d'Alencé décrit, dans son ouvrage publié en 1668,[14] un thermomètre à alcool, muni d'un tube scellé de trois pieds de hauteur et d'un diamètre sensiblement égal à celui d'un "brin de chanvre."

Parmi tous les problèmes qui se posaient aux physiciens, l'un des plus délicats à résoudre fut celui de la détermination des "points fixes," des "repères" fondamentaux pour les comparaisons et le tracé de l'échelle de graduation. Après de nombreux tatonnements, on décida de prendre comme points fixes, d'une part celui qui correspond à la température du mélange glace-sel, et d'autre part le point "tempéré" déterminé par la température des caves de l'Observatoire de Paris (12 à 13° C.).[15]

Vers la fin du XVII° siècle, la température d'ébullition de l'eau parait susceptible d'être adoptée comme un repère fixe. Puis, au XVIII° siècle, divers thermomètres peuvent être considérés comme étant des instruments de comparaison valables, tels que ceux Fahrenheit (1714), Réaumur (1741) et Celsius (1742).

Ces longues et patientes recherches révélèrent aux savants, dont l'ingéniosité ne le cède en rien au goût de la recherche déjà scientifique, les difficultés qui doivent être surmontées dès qu'il s'agit d'obtenir quelque précision dans la mesure d'une grandeur physique. Ici, le gain de précision acquis lentement au cours du temps fut subordonné à la mise au point de techniques opératoires concernant par exemple : la fabrication de tubes de verre à peu près homogènes et bien calibrés; la purification chimique des liquides; la manière de les introduire dans l'instrument; détermination des points fixes, etc.

[13] *Ibid.*, Tome III. Paris, Presses Universitaires de France, 1946. 664 pp. (Jean Rey, né au Bugue (Dordogne) vers 1583; docteur en médecine de la Faculté de Montpellier en 1609.)

[14] Joachim d'Alencé. *Traité des baromètres, thermomètres et notiomètres ou hygromètres.* Amsterdam, 1688.

[15] Machabey, Armand, Jr. *Aspects de la métrologie au XVII^e siècle.* Université de Paris. Les conférences du Palais de la Découverte. Série D, n° 33, novembre 1954. 18 pp.

Ce gain est aussi le fruit de travaux d'approche scientifiques : recherche des causes d'erreurs qui résultent de l'insuffisance du vide, de la qualité du verre, des corrections dues aux dilatations, des procédés de graduation, etc. Ainsi, pratiquement, l'accroissement de la précision de la mesure d'une grandeur quelconque est contrarié par de grandes difficultés techniques, que le métrologiste s'efforce à surmonter. Il ne peut aboutir à des résultats positifs, exploitables, qu'après avoir avoir déterminé les diverses causes d'erreurs qui affectent les résultats des mesures.

La science et la technique sont étroitement associées à la recherche de ces erreurs et aux moyens qui peuvent, sinon les éliminer, au moins en tempérer les effets dans les opérations de mesurage.

Les exemples qui précèdent laissent entrevoir qu'au XVI° siècle et surtout au XVII° siècle, les savants prêtaient une attention de plus en plus grande à ces questions et qu'ils amorçaient l'évolution ultérieure de la science des mesures.

Il suffit en effet de s'adresser à la métrologie des XIX° et XX° siècles pour constater le développement, sur une vaste échelle, de la démarche technico-scientifique entreprise par ces pionniers.

Par exemple, à la fin du XVIII° siècle les savants français, créateurs du "Système Métrique Décimal," mettent en oeuvre toutes les ressources de la science et de la technique, toutes les précautions expérimentales imaginables à cette époque, pour atteindre, avec la plus haute précision possible, le but que leur assignait la réalisation d'un système de mesure simple, uniforme et appelé à devenir universel.

C'est ainsi, qu'en vue de la création de la nouvelle unité de mesure de longueur, le "METRE," les règles géodésiques de Borda (1733-1799)[16] assorties de verniers, étaient formées de barres bi-métalliques, platine-laiton, dont l'ensemble constitute un thermomètre. Les expériences sur les dilatations respectives du platine et du laiton firent ressortir que ces thermomètres bi-métalliques variaient de 0,02 mm par degré de température, précision particulièrement élevée à cette époque.[17]

Toujours en ce qui concerne la détermination du "mètre," le degré de précision des comparaisons effectuées avec le comparateur créé par l'ingénieur parisien Etienne Lenoir (1744-1832) était du

[16] Bigourdan, G. *Le système métrique des poids et mesures.* Paris, Gauthier Villars, 1901. 458 pp., pl. et fig.

[17] *Ibid.*

même ordre de grandeur,[18] ce qui semble marquer la limite maximum susceptible d'être obtenue vers la fin du XVIII° siècle. Ce fut évidemment la précision du "METRE" prototype (à la température de zéro degré), déposé aux Archives en 1799.

Plus tard, lorsque la "Convention Internationale du Mètre" fut signée (le 20 mai 1875),[19] le prototype international reçut une définition conventionnelle se substituant à celle du mètre des Archives, alors rattaché au méridien terrestre.

Le nouveau prototype est un mètre à traits (et non un mètre à bouts, comme l'était le prototype des Archives). La distance de deux traits, tracés sur la barre à section en forme d'X, en platine allié à 10 per cent d'iridium, définit l'unité de mesure de longueur, le "Mètre international" (à la température de zéro degré), avec une précision de l'ordre de 10^{-7}. S'agissant des répliques de ce prototype—les mètres étalons nationaux—l'épaisseur des traits était, à cette époque, de l'ordre de huit microns. De nouveaux perfectionnements apportés aux procédés de graduation ont permis, dès 1937, au Bureau International des Poids et Mesures à Sèvres, de réduire cette épaisseur à trois microns.[20]

L'intervention du microscope micrométrique a joué et joue un rôle essentiel dans ces diverses opérations, car le recours à cet instrument permet notamment d'obtenir une gamme d'agrandissement jusquà 1,000 environ, et de réaliser des répliques du mètre prototype d'une haute précision.

En vue d'aboutir à des solutions satisfaisantes, on voit qu'il avait été indispensable d'amplifier sensiblement l'échelle d'observation pour accroïtre la précision des comparaisons.

A peu près à la même époque, vers la fin du XIX° siècle, apparaissent les premiers étalons industrials, dits "broches," destinés au contrôle des étalons d'atelier employés à la fabrication des pièces interchangeables. Vers 1910, le constructeur suédois C. E. Johansson (à Eskilstuna, Suède) lance sur le marché des étalons ("cale" ou "calibre") d'acier de forme parallélipipédiques. Leurs faces planes opposées étant parfaitement polies ont la propriété d'adhérer, par attraction moléculaire, aux faces d'un

18 *Ibid.*

19 France. Bureau International des Poids et Mesures. *Convention internationale signée à Sèvres le 6 octobre 1921,* portant modification de la Convention du Métre signée à Paris le 20 mai 1875 et de son règlement annexé. Paris, 1950.

20 Perard, A. *Les mesures physiques.* Paris, Presses Universitaires de France, 1955. 136 pp., illus.

autre étalon de même nature. Cette propriété physique permet de former des chaînes de calibres accolés et d'obtenir de cette façon les cotes les plus diverses.[21]

Les tolérances sont très faibles, car les erreurs des calibres placés bout à bout s'additionnent. C'est pourquoi Johansson fixa ces tolérances proportionnellement à la longueur des cales, à 10^{-5}, soit un micron pour un calibre de 100 mm, un dixième de micron pour un calibre de 10 mm, etc. La précision des cales-ëtalons proprement dites doit être évidemment supérieure à celles des cales d'atelier. La méthode interférentielle employée à cet effet reporte la limite de prêcision au centième de micron environ.

Si ces méthodes ont été conçues dans le dessein d'atteindre une telle finesse dans la précision et de résoudre les problèmes posés par des nécessités industrielles, elles ne peuvent toutefois être viables que dans la mesure où les procédés de fabrication concilient les limites de tolérances d'usinage avec les possibilitiés techniques permettant de les observer. C'est pourquoi les techniciens ont été conduits à créer des instruments de mesure à lecture directe, tels que les comparateurs à amplification mécanique, optique, pneumatique, électronique, qui procurent le moyen d'obtenir, suivant leurs caractéristiques, des amplifications de l'ordre de 1,000 à 100,000 (et au delà).

A ce niveau d'amplification très élevé, qui peut être atteint grâce aux méthodes électroniques, il convient de noter que, si la sensibilité de l'instrument est considérablement accrue, des réserves doivent être faites au sujet de la précision vraie. Car les comparateurs électroniques font appel à une source d'énergie extérieure et transforment les variations de la grandeur à mesurer (transmises par un palpeur qui accuse les variations de cote de la pièce à usiner) en des variations d'énergie, amplifiées par la suite, puis traduites sous la forme d'indications chiffrées (ou codées) sur un récepteur (cadran gradué ou à chiffres alignés, bande magnétique, etc.). Or, de très judicieuses précautions doivent être prises pour éviter que l'opération de mesure perde tout son sens. Le palpeur doit être au contact direct de la pièce à façonner et ne pas en être séparé par des poussières, par une pellicule de graisse, etc. ; il ne doit pas non plus exercer sur la pièce une pression qui la déformerait.

21 Guillaume, C. E. *La création du Bureau International des Poids et Mesures et son oeuvre.* Paris, Gauthier-Villars, 1927. 321 pp., illus.

Par ailleurs, le milieu au sein duquel on opère exerce une influence directe sur les mesures. On sait, par exemple que les variations de la température (dite grandeur d'influence) provoquent les erreurs les plus importantes (une variations de 1° C. sur une pièce de 100 mm provoque une variation de 1,16 micron !). L'opérateur qui surveille sa machine est, lui aussi, une source de rayonnement calorifique; les champs électro-magnétiques constituent de leur côté des éléments perturbateurs difficiles à isoler et à éliminer complètement.

Pour conclure, un instrument de mesure de haute précision doit être thermiquement isolé, placé sous cage, de façon à être à l'abri dans toute la mesure du possible des sources parasites—conditions qui ne sont pas toujours faciles à satisfaire intégralement.

Au surplus, la tendance est de plus en plus au contrôle opératoire, c'est-à-dire au transfert, près de la machine-outil, du comparateur indispensable au contrôle de la pièce usinée, ce qui permet de contrôler le travail de la machine.

L'élément perturbateur humain a même été réduit dans certains cas, notamment en faisant des mesures sur la machine-outil elle-même, qui, de ce fait, devient une "auto-calibreuse." C'est le cas plus particulièrement des rectifieuses, qui assurent la finition d'une pièce.

Voici donc une solution frappante apportée à un problème de métrologie et qui procure le moyen d'obtenir, en permanence, dans un atelier de fabrication, une haute précision qui parait pouvoir se situer entre un et une dizaine de microns environ.

L'exiguïté de cette étude ne nous permet pas de passer en revue tous les domaines techniques qui préoccupent le métrologiste. Dans les nombreux secteurs où s'exerce son activité, celui du pesage est l'un des plus importants, et il nous faut bien en dire un mot.

Bien que l'électronique se soit introduite dans la mesure des masses par l'amplification de variations de tension provenant de variations de résistances (strain-gage, jauges à magneto-striction, flux lumineux), il n'en reste pas moins que la balance à fléau à bras égaux, dont les titres de noblesse sont au moins cinq fois millénaires, demeure jusqu'ici l'instrument de comparaison qui, bien étudié, soigneusement construit, et utilisé avec toutes les précautions techniques adéquates, est susceptible d'atteindre un degré de précision extraordinaire, de l'ordre du centième de milligramme au moins, en valeur instantanée, s'agissant de comparer des masses de l'ordre de un kilogramme.

C'est là un résultat scientifique tout à fait remarquable et qui vient clore le rapide périple qui nous a conduit de l'antiquité aux confins de la métrologie moderne, en nous arrêtant, chemin faisant, sur quelques aspects caractéristiques de l'évolution de cette science des mesures.

Mais il est permis de se demander si cette évolution peut se poursuivre indéfiniment tout en restant viable. Car la recherche de la précision et de son accroissement n'est pas absolument une fin en soi, puisqu'elle ne présente un intérêt que si la grandeur à mesurer est définie, ainsi que les limites de la précision à atteindre.

Il serait, par exemple, illusoire de chercher à définir la mesure d'un poids de commerce ordinaire, en fonte, au millième près de sa valeur, car le poids s'oxyde, se modifie, incorpore des ingrédients (poussières, graisses, etc.), sur sa surface. Il n'en est pas de même avec un poids en laiton, poli et doré et qui, en valeur instantanée, peut atteindre une précision de l'ordre de 10^{-8}.[22]

On a donc été conduit à étudier soigneusement les grandeurs physiques, à les classer, les définir et à créer la notion de "domaines-limites," au-delà desquels il se révèle que l'accroissement de la précision est dépourvue de sens.[23]

Ici, nous commençons, à toucher du doigt la philosophie de cette science des mesures. La "domaine-limite" est celui à l-extérieur duquel les lois, auxquelles obéissent les grandeurs mesurées ou observées, ne sont plus valables, c'est-à-dire, lorsqu'il n'est plus possible de savoir si la précision ou le gain de précision correspondent effectivement à une réalité physique.

C'est le cas, pour ne citer qu'un exemple, d'une règle de métal dont la mesure est définie par la distance qui sépare les faces terminales planes en principe. Or, cette mesure devient incohérente lorsque l'amplification de l'échelle d'observation dépasse une certaine limite—qui n'est autre que celle du "domaine-limite," puisque, à la surface présumée plane, font place des éléments cristallins d'une structure toute différente.

D'autre part, une autre limitation intervient dans le processus expérimental. C'est le pouvoir de résolution de l'instrument de mesure, ou de la chaïne de mesure, c'est-à-dire l'aptitude de l'un ou de l'autre, à éliminer les grandeurs perturbatrices et à ne conserver que la grandeur dont on se propose la mesure. La tempéra-

[22] Viaud, Francis. Ia précision dans les mesures commerciales et industrielles de masse. *Rev. Métrol. prat. lég.*, décembre 1952, pp. 613-625.

[23] Zelbstein, U. La notion des domaines-limites. Paris. Actes des journées d'étude: "Mesure et Connaissance, 1955." *Revue de Métrologie pratique et légale*, 1957, 117-126. *Voir aussi* Russo, Le Père F. La notion de mesure physique, *op. cit.*, pp. 35-43.

ture, les champs électro-magnétiques, le temps, (durée), sont notamment des grandeurs d'influence, qui agissent sur les instruments et sur les résultats de mesure.

Il est donc nécessaire de faire l'étude de chaque instrument, afin de déterminer les limites au-delà desquelles ces grandeurs d'influence modifient leurs caractéristiques métrologiques et leur précision.

Enfin,un autre aspect de la mesure mérite que nous nous y arrêtions un cours instant. Il s'agit des réactions mutuelles de l'opérateur et de l'instrument de mesure.

On apprécie, chez l'opérateur, la souplesse, la subtilité de ses sens qui lui permettent, presque instantanément, de réagir là où une machine robot serait désarmée.

Par contre, son défaut de fidélité n'est pas niable. Il varie et divers éléments y contribuent: fatigue, éclairage, bruits, etc. Ces éléments n'ont pas le même "poids" à tel moment ou à tel autre. Ceci explique qu'il n'est pratiquement pas possible de "fixer" le coefficient global d'erreur d'un opérateur et encore moins d'en chiffrer les variations. Toutefois, l'operateur est généralement qualifié pour exploiter les résultats de mesure, exploitation délicate, puisqu'il s'agit toujours de valeurs expérimentales, donc approchées.[24]

Etant donné que la répétition des mesures appliquées à une même grandeur conduit rarement à des valeurs identiques (par exemple le contrôle sur une balance de précision de 1,000 poids d'un gramme fabriqués en série), celles-ci présentent une certaine dispersion par rapport à la moyenne ; la concentration ou l'éparpillement des résultats au voisinage de cette moyenne fournissent des éléments d'appréciation, non seulement sur la qualité de l'instrument et, plus précisément, sur celle du couplage "opérateur-instrument," mais en outre sur la valeur la plus probable de la grandeur mesurée.

Par ailleurs, la dispersion des résultats de mesure provient, dans de nombreux cas, du phénomène observé et non des instruments, parce que ce phénomène à un caractère aléatoire. Par exemple, le matériau employé dans la fabrication de pièces en série n'est pas homogène constamment; la pression de l'outil varie, ainsi que la température, etc. Pratiquement, la plupart des méthodes de contrôle statistiques de la qualité sont fondées sur ce caractère aléatoire.

42 Bachelard, Gaston. *Essai sur la connaissance approchée.* Paris, Librairie Philosophique Vrin, 1928. 310 pp.

Dans l'étude de la "population" des mesures d'une grandeur (grandeur qui a dû nécessairement être définie au préalable—cas des poids d'un gramme déjà cité), il est habituel de procéder comme si les mesures successives étaient totalement indépendantes au sens probabiliste. C'est-à-dire que la loi de probabilité de la $N^{ième}$ mesure est considérée comme étant indépendante des résultat des $(N-1)^{ièmes}$ mesures précédentes. Or, dès 1922, Pearson avait dégagé une liaison de dépendance, qui attira l'attention des spécialistes.[25]

Les recherches effectuées en ce domaine ont confirmé cette liaison et ont même permis d'établir, sur des cas précis, le coefficient de corrélation entre deux mesures successives réalisées par le même opérateur. Nous nous trouvons ici en présence d'un intéressant problème situé aux limites de la métrologie et du comportement humain, et qui ne parait pas avoir encore reçu une explication complète. Il y aurait peut-être là un sujet de recherche posé par l'interprétation statistique des résultats de mesure, et qui se trouve au carrefour de diverses sciences : métrologie, mathématique, physique et psychologie.

C'est sur cette suggestion que nous achèverons cette rapide étude. Peut-être avons-nous dépassé les limites "précises" qui nous étaient imparties et, si tel est le cas, nous nous en excusons vivement, car ceci est évidemment impardonnable pour un métrologiste.

25 Darmois, Georges. Le rôle des méthodes statistiques dans l'exploitation des mesures. Paris, Actes des journées d'étude: "Mesure et Connaissance 1955." *Op. cit.*, pp. 77-80.

Egyptian Glass Pharmaceutical Measures of the 8th Century A.D.

GEORGE C. MILES*

THERE are four categories of inscribed Egyptian metrological glass objects dating from the early centuries of Islam: coin weights, heavier weights (the *wuqīyah* or ounce, and the *raṭl,* or pound), tokens or jetons (these chiefly from the Fāṭimid and Mamlūk periods), and vessel stamps. This paper is concerned only with the last of these categories.[1] Known variously by European orientalists as bottle-stamps or vessel-stamps, it is now clear that these objects were pharmaceutical labels attached in a semi-molten state to the sides of drug jars or measures. Examination of the legends on a large number of these impressed stamps establishes the fact that practically without exception the liquids, semi-liquids, substances, and seeds named were elements of the Arab pharmacopoeia; indeed, in most cases their use as materia medica can be traced back to classical Greek times, and in many instances they are to be found today in the formulae of medicinal herbalists or even in the official *Dispensatory* or *Pharmacopoeia.* In 1951 the writer first proposed this explanation of the use of these glass stamps, but at that time only a few examples were dealt with. Since then the writer has assembled a considerable body of material from public and private collections in Egypt, Europe, and America, much of it unpublished. In the present paper a preliminary summary of the substance of the findings is presented.[2]

These measure stamps, inscribed in simple Kufic characters and measuring between 18 and 60 millimeters in diameter, contain one or more of the following classes of information: (i) the name of the issuing official or officials (but some are anonymous); (ii) a measure of capacity or weight, or fraction or multiple of a measure or weight; (iii) the seed, fruit, substance or liquid, sometimes with a qualifying adjective distinguishing among various types of the medicament in question; (iv) the date (rarely); (v) pious phrases enjoining honesty and fair measure.

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1 A brief report embodying a general statement of the material contained in this paper was read at the annual meeting of the American Oriental Society in New York on 1 April 1958.

With respect to each of these classes of information, an analysis of the data now in the writer's files shows the following:

1. Some 70 different names of officials (caliphs, governors, finance directors, prefects) occur. Among these 20 or more are so far unidentified. The earliest identified functionary is Qurrah b. Sharīk, Governor of Egypt from 90 to 96 A.H./709-714 A.D., and the latest is Aḥmad b. Ṭūlūn, Governor and later semi-independent ruler of Egypt, 254-270 A.H./868-884 A.D. The many anonymous measures are probably of the late 1st and early 2d centuries of the Hijrah, that is, of the first half of the 8th century.

2. Among the measures specified the commonest is the *qisṭ*, its half and especially its quarter. The word *qisṭ* (derived from Greek ξέστης) appears sometimes to have signified a specific measure, roughly equivalent to a pint, but in other cases the meaning seems merely to have been "measure," the capacity varying according to the commodity. Very frequently *qisṭ*, or a fraction of a *qisṭ*, occurs alone, that is, without the mention of a specific drug. The date range of the word *qisṭ* is 90 to 234 A.H./709-849 A.D. Also very common is the *mikyalah*, an unspecific word for "measure"; but doubtless a *mikyalah* of a given medicament had a certain legally defined capacity. The date range for this word is 96 to 158 A.H./714-775 A.D. The *qadaḥ* or "cup" is uncommon (99-105 A.H./717-723 A.D.). Two weight designations occur on the stamps: The *raṭl*, "pound" (90-158 A.H./709-775 A.D.), and the *wuqīyah*, "ounce" (in the mid-120's A.H./ca. 743 A.D.).

[2] The principal books and articles in which Arab glass measure stamps have been published are the following (abbreviations appear in parentheses following each title):

Stanley Lane-Poole, *Catalogue of Arabic glass weights in the British Museum*, London, 1891. (*B.M.*)

P. Casanova, *Catalogue des pièces de verre des époques byzantine et arabe de la collection Fouquet*, Paris, 1893. (*Fouquet*)

Adolf Grohmann, "Arabische Eichungsstempel, Glasgewichte und Amulette aus Wiener Sammlungen," in *Islamica*, Leipzig, 1925, pp. 145-226.

Sir Flinders Petrie, *Glass stamps and weights illustrated from the Egyptian collection in University College, London*, London, 1926. (*University College*)

G. C. Miles, *Early Arabic glass weights and stamps*, New York, 1948. (*E.A.G.*)

G. C. Miles, *Early Arabic glass weights and stamps: A supplement*, New York, 1951. (*E.A.G. Suppl.*)

A. Launois, *Estampilles et poids faibles en verre omeyyades et abbasides au Musée Arabe du Caire*, Cairo, 1956. (*Cairo*)

F. Viré, "Dénéraux, estampilles et poids musulmans en verre en Tunisie," in *Les Cahiers de Tunisie*, 1956, pp. 17-90. (*Viré*)

G. C. Miles, *Contributions to Arabic metrology*, I, New York, 1958. (*C.A.M.*, I)

A full bibliography down to about the year 1937 will be found in J. Walker's article, "Sanadjāt," in the *Supplement* to the 1st edition of the *Encyclopaedia of Islām*, Leiden, 1938.

3. The names of more than 50 drugs and cosmetics have been read on the stamps. Some of the readings await confirmation and positive identification, but there can be no doubt about the correctness of the decipherment and attribution of many of them. Among these are:

Bisillah, pea, *Pisum sativum. Fouquet,* nos. 73-74.[3]

Baqs, common box tree, *Buxus sempervirens.* Unpublished, except erroneously as *naqsh* (*Fouquet,* no. 93) or *mishsh* (*C.A.M.,* I, nos. 85, 117-119, 273), etc. The present reading has been proposed to the writer by Dr. Paul Balog of Cairo.

Turmus, lupin, *Lupinus termis,* sometimes qualified as shelled, polished, or pure. *E.A.G. Suppl.,* no. 15.

Tīn, fig. *C.A.M.,* I, no. 12.

Juljulān, sesame-seed, variously qualified by color, and dessicated. *E.A.G. Suppl.,* no. 17.

Jullanār, pomegranate, both shelled and pure. *C.A.M., I,* no. 269.

Ḥulbah, fenugreek, *Trigonella Foenum-graecum. Cairo,* no. 148 bis.

Ḥimmaṣ, chick-pea, *Cicer arietinum,* also qualified by color, dessicated, boiled, shelled, and pure. *E.A.G. Suppl.,* no. 24.

Ḥinnā', henna, *Lawsonia alba. University College,* no. 142 (misread in several respects).

Khaukh, peach. *Fouquet,* no. 85.

Duhn, fat or grease, especially a pomade for the hair. *E.A.G.,* no. 2.

Dūm or *dūmah,* fruit of the gingerbread tree, *Hyphaena thebaica.* Unpublished, Museum of Islamic Art, Cairo.

Zayt, olive oil (very common). *E.A.G.,* no. 6, and *E.A.G. Suppl.,* p. 49.

Sukk, an astringent compound medicament, of which the principal ingredient appears to have been *rāmik,* a kind of pitch. *Fouquet,* no. 91. See also *E.A.G. Suppl.,* no. 41, where doubtless the same word was read, probably erroneously, *sukkar,* which reading led to a long excursus on the introduction of sugar into Egypt, a digression which perhaps is irrelevant.

Shamār, fennel or dill, *Foeniculum vulgare* or *Anethum graveolens. E.A.G. Suppl.,* no. 25.

Subbār, tamarind, *Tamarindus officinalis.* Unpublished, Harold W. Glidden Collection, Arlington, Va.

Ṭilā', either "ointment" or "cooked wine." *E.A.G.,* no. 7. Cf. D. S. Rice's remarks on *tilā'* in an article entitled "Deacon or drink: some paintings from Samarra re-examined," in *Arabica,* 1958, 5, 21-22.

'Ubab, common winter cherry, *Physalis alkekengi.* Unpublished, but discussed by Viré, p. 24. The Louvre, Paris.

'Adas, lentil, *Lens esculenta,* in several colors and variously processed. *E.A.G. Suppl.,* no. 42.

'Asal, honey. *C.A.M.,* I, no. 13.

'Uṣfur, safflower, bastard saffron, *Carthamus tinctorius. Cairo,* no. 15.

Katam, privet, *Buxus dioica.* Unpublished, Ray W. Smith Collection, Dublin, New Hampshire.

Kusbur, coriander, *Coriandrum sativum. Fouquet,* no. 131, and perhaps *Cairo,* no. 66, read as "chestnuts."

[3] Reference is given to one publication only of each commodity, and preferably to a publication where the medicinal is discussed.

Kammūn, cumin, *Cuminum cyminum,* also qualified as black and white. *E.A.G. Suppl.,* no. 16. Cf. G. C. Miles, "Cumin and Vinegar for Hiccups," in *Archaeology,* 1951, *4,* 23-24.

Nabaq, jujube, *Zizyphus Spina Christi,* etc. *C.A.M.,* I, nos. 63-64.

Wasmah or *wusmah,* woad, *Isatis tinctoria. E.A.G. Suppl.,* no. 5.

The earliest mention of a specific drug or cosmetic (*duhn*) is during Qurrah's governorship (90-96 A.H./709-714 A.D.), unless the anonymous measures be earlier, which is unlikely; and the latest is between 143 and 158 A.H./760-775 A.D.

4. Specific dates are rare and are limited to the first quarter of the 2d century of the Hijrah (second quarter of the 8th century A.D.).

5. Among the pious phrases testifying to the correctness of the measure are: *'amara'llāhu bi'l-wafā',* "Allah commanded the fulfillment of promises," or simply *al-wafā' li'llāh* (which sometimes occurs alone, without any issuing authority or specification of content); Koran XXVI, 181 and 183, "Give just measure and be not among the defrauders," and "diminish not unto men any of their possessions." The word *wāfi, wāfīyah,* "full measure," very frequently terminates the legend.

The following examples are illustrated in the plates:

Fig. 1. Glass measuring jug with stamp bearing the inscription, "Measure of fine olive oil." Height: 75 mm. Capacity: 60 cc. Museum of Islamic Art, Cairo, Inv. No. 14.646. *E.A.G. Suppl.,* p. 53, pl. III, fig. 2. Courtesy, Museum of Islamic Art, Cairo.

Fig. 2. Glass measuring jug with illegible stamp. Green. Height: 39 mm. Diameter at rim: 27 mm. Capacity: 5.9 cc. Property of H. Dunscombe Colt, to whom the writer is indebted for permission to illustrate this vessel.

Fig. 3. Glass measuring jug with illegible stamp. Height: 34 mm. Capacity: slightly less than 3 cc. Museum of Islamic Art, Cairo, Inv. No. 13.716/3. *E.A.G. Suppl.,* p. 53, pl. III, fig. 5. Courtesy, Museum of Islamic Art, Cairo.

Fig. 4. Glass stamp bearing the inscription, " 'Abdullāh Yazīd, Commander of the Believers (may God keep him straight) ordered a *qadaḥ,* without brim (?), full measure; executed by Ḥayyān b. Shurayḥ." Green. Diameter: 50 mm. Property of the writer. "A glass Measure issued by Ḥayyān b. Shurayḥ," in *Studi Orientalistici in onore di Giorgio Levi Della Vida* (Rome, 1956), II, pp. 148-158. The Caliph Yazīd ruled from 101-105 A.H./720-

724 A.D. Ḥayyān b. Shurayḥ was Finance Director of Egypt. The *qadaḥ* or "cup" was a measure of volume, the exact capacity of which at this date is uncertain. It was used chiefly for dry substances such as cereals, rice, and sugar, but also for liquids, specifically olive oil. The curious phrase following the word *qadaḥ* is probably to be interpreted as meaning "Filled to the brim but not running over." This interpretation is discussed at length in the article cited above.

Fig. 5. Glass stamp bearing the inscription, "Order of the Amīr Qurrah: one-half *raṭl* of *duhn* (grease)." Green. Diameter: 32 mm. American Numismatic Society. *E.A.G.*, no. 2. Qurrah b. Sharīk was governor of Egypt from 90 to 96 A.H./709-714 A.D. Many varieties of *duhn,* possessed of medicinal properties, are described by the famous Spanish Arab botanist and pharmacologist Ibn al-Bayṭār.

Fig. 6. Glass stamp bearing the inscription, "In the name of Allāh: al-Qāsim b. 'Ubaydullāh ordered the making of a measure of shelled (or peeled) *jullanār* (pomegranate), full measure." Green. Diameter: 39 mm. American Numismatic Society. *E.A.G.*, no. 37. See also *C.A.M.* I, no. 269, an anonymous measure for dessicated *jullanār,* and pp. 111-112, where the medicinal uses of various elements of the pomegranate are discussed. The writer had originally read the word as *julubbān* or *jilbān,* "chickling vetch" or *Lathyrus sativus* (both readings are possible in the ambiguous Kufic alphabet); but as *Lathyrus sativus* taken in any quantity can produce a type of paralysis, it seemed that "pomegranate," whose therapeutic properties are recognized, was the more likely reading. However, chickling vetch was widely cultivated in Egypt and is frequently mentioned in the papyri (e.g., A. Grohmann, *Arabic Papyri in the Egyptian Library,* Vol. V, Cairo, 1955, pp. 121-122), and perhaps the question of the correct reading on these glass stamps should be left open. Al-Qāsim b. 'Ubaydullāh, who issued a very large number of stamps and weights, was Finance Director of Egypt from 116 to 124 A.H./734-742 A.D.

Fig. 7. Glass stamp bearing the inscription (reconstructed), "The Servant of Allāh, 'Abdullāh, Commander of the Believers, ordered the making of a measure of black *kammūn* (cumin), full measure." Green. Diameter: 36 mm. American Numismatic Society. *C.A.M.*, I, no. 116. "Black cumin" is discussed in *E.A.G. Suppl.*, p. 16. " 'Abdullāh, Commander of the Believers," is the

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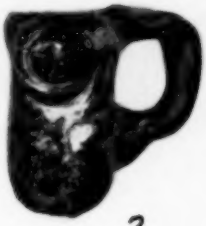

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Caliph al-Manṣūr, grandfather of Hārūn al-Rashīd, 136-158 A.H./754-775 A.D.

Fig. 8. Glass stamp bearing the inscription, "Nawfal b. Furāt ordered the making of one-quarter *qisṭ*, full measure." Green. Diameter: 40x36 mm. American Numismatic Society. *C.A.M.*, I, no. 129. For observations on the *qisṭ*, see *E.A.G.*, p. 19; Florence E. Day, "An Umayyad pharmacist's measuring cup," in *Metropolitan Museum of Art Bulletin*, May, 1953, p. 259; and A. Grohmann, *Arabic Papyri*, V, pp. 153-154. Nawfal b. al-Furāt was Finance Director of Egypt from 141-143 A.H./759-760 A.D.

Fig. 9. Glass stamp bearing the inscription, "In the name of Allāh: the Amīr Muḥammad b. al-Ash'ath ordered the making of a measure of *shamār* (fennel), executed by 'Abdullāh b. Rāshid." Green. Diameter: 39 mm. Royal Ontario Museum of Archaeology. *E.A.G. Suppl.*, no. 25, where both *Foeniculum vulgare* and *Anethum graveolens* are discussed. Muḥammad b. al-Ash'ath was Governor of Egypt during the period when Nawfal b. al-Furāt was Finance Director, 141-143 A.H./759-760 A.D.

Fig. 10. Anonymous glass stamp bearing the inscription, "Measure of *sukk*," or perhaps "Measure of *sukkar* (sugar)." Part of the rim of the cup is preserved. Green. Diameter: 25 mm. American Numismatic Society. *E.A.G. Suppl.*, no 41. See the word *sukk* in the list above.

Fig. 11. Anonymous glass stamp bearing the inscription, "Measure of red *'adas* (lentil)." Green. Diameter: 32 mm. American Numismatic Society. *E.A.G.*, no. 179. "Red lentil," probably *Lens esculenta erythrosperma*, a common crop in Egypt and Western Asia, is discussed in *E.A.G. Suppl.*, p. 46.

The Line-less Sounder: An Episode in the History of Scientific Instruments

ROBERT P. MULTHAUF*

ALTHOUGH our earliest documented evidence of oceanographic sounding occurs in the writings of the Greek geographer, Strabo (ca. 63 B.C.-ca. 20 A.D.), it can hardly be doubted that the question is as old as man's curiosity about his environment. Strabo reveals that it was not merely a matter of speculation in his time, but that attempts had actually been made to measure the greatest depths of that body of water with which he was most familiar, the Mediterranean.[1] Since he does not say how it was done, we must suppose that the instrument used was the only sounding device recorded in antiquity, the already time-honored lead and line of the seaman.

The sounding lead and line is undoubtedly one of the most ancient scientific instruments, and probably owes its origin to a period not much inferior to that of the ship itself. It is mentioned in written records as early as Herodotus (ca. 450 B.C.) and not as something new.[2] It is a simple solution to a fundamental, practical problem. That it is not a completely satisfactory solution is certified by many shipwrecks. Nevertheless, it remained superior to all attempts at its replacement until the successful developments of sonic sounding methods in the 1920's. Its principal defects, from the point of view of the mariner, were (i) the difficulty of "feeling" the impact of the lead against the bottom, (ii) the bowing of the line by currents or the ship's motion, and (iii) the time required for its use, which prevented continuous sounding. To remedy the first defect it was already modified in antiquity so as to bring up a bottom-sample, thus proving that contact had actually been made.

From the point of view of the oceanographer, these defects apply with similar force but are overshadowed by another one, the difficulty of managing the extreme lengths of line required. The first, and the majority, of all inventions which have marked the

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1 *Geography*, I, 3.

2 *History*, II, 1.

long history of attempts to improve sounding methods have been concerned with the sounding of deep water. It does not appear, however, that the first attempts at the improvement of the sounding instrument were inspired by any demand on the part of the oceanographer. They seem rather to have been by-products of that spectacular revival of science which began in the late European Middle Ages and which is now loosely referred to as "the scientific revolution." And they exemplify the curiously incidental way in which scientific instruments emerged out of the preoccupation of the scientist of that time with experience (observation) and measurement.

The scientific revolution began with late medieval criticism of the official or "Aristotelian" description of the physical sciences and soon produced original explanations of physical phenomena inspired by a passion for experience and measurement, from which combination finally emerged the controlled experiment. One of the earliest of these new scientists, Cardinal Nicolaus Cusanus (1401-1464) introduced what was to become the most persistent attempt at the basic improvement of oceanographic sounding, in a context which illustrates the subtle and curious reasonings out of which modern science arose. In his remarkable treatise, *De staticis experimentis,* on the importance of weighing, a philosopher and a mechanic (probably meaning an experimental philosopher) are found discussing the usefulness of this experimental technique. At one point they are particularly interested in determining what can be learned from comparisons of weight and propose, among other things, to determine the weight of the air by a comparison of the times required for pieces of stone and wood of identical size to fall from a high tower. They conclude that the weight of the air might be inferred by some such method, and the philosopher goes on to remark that he has heard that the depth of the sea (not its weight!) might be determined in a similar way. The mechanic acknowledges that this is true and gives this explanation:

> It might be done with lead made into the image of an eight-day moon, with one horn heavier and the other lighter and upon the lighter should be hung a fruit or other light thing of similar nature, and after the lead had dragged the fruit to the bottom, first touching the earth with its heavier horn and then bending over, the fruit having been released from the horn would return to the surface. Knowledge would be obtained by using a similar lead and fruit in other water of known depth for from the different weights of water flowing out of a clock from the time the lead was cast forth to the

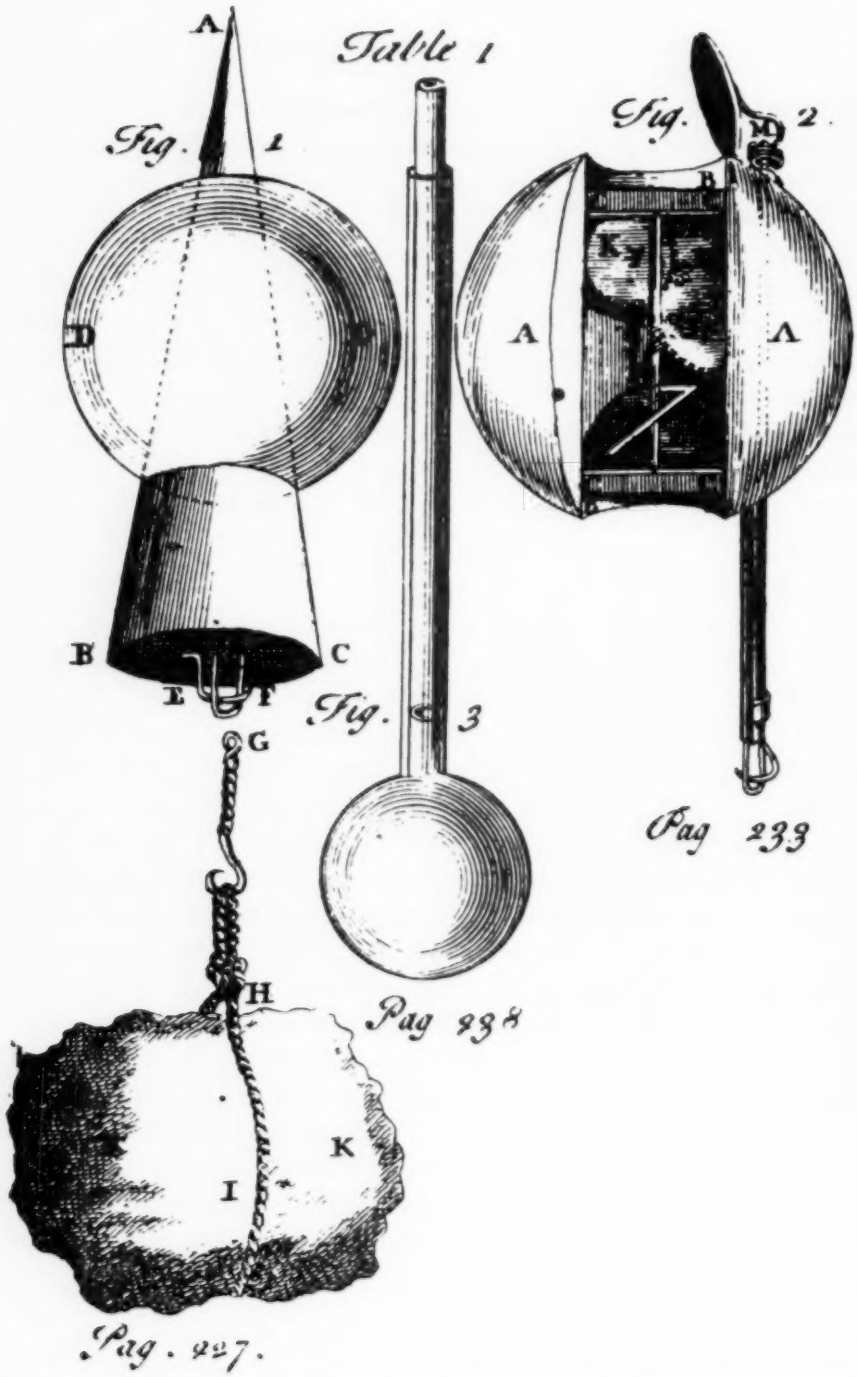

FIG. 2. Drawings of Hooke's improved sounders (1691). Fig. 1 incorporates a hollow metal cone fixed through the wooden float. Water enters the cone at its apex, the quantity being proportional to the depth to which it has descended. In Fig. 2 the float has a cylindrical hole containing a propeller and odometer such as he has previously used in his ship's log. Fig. 3 is a deep sea thermometer. From Derham.

FIG. 1. Sounder described by Robert Hooke to the Royal Society (1667). Replica made by L. C. Eichner for the Smithsonian Institution.

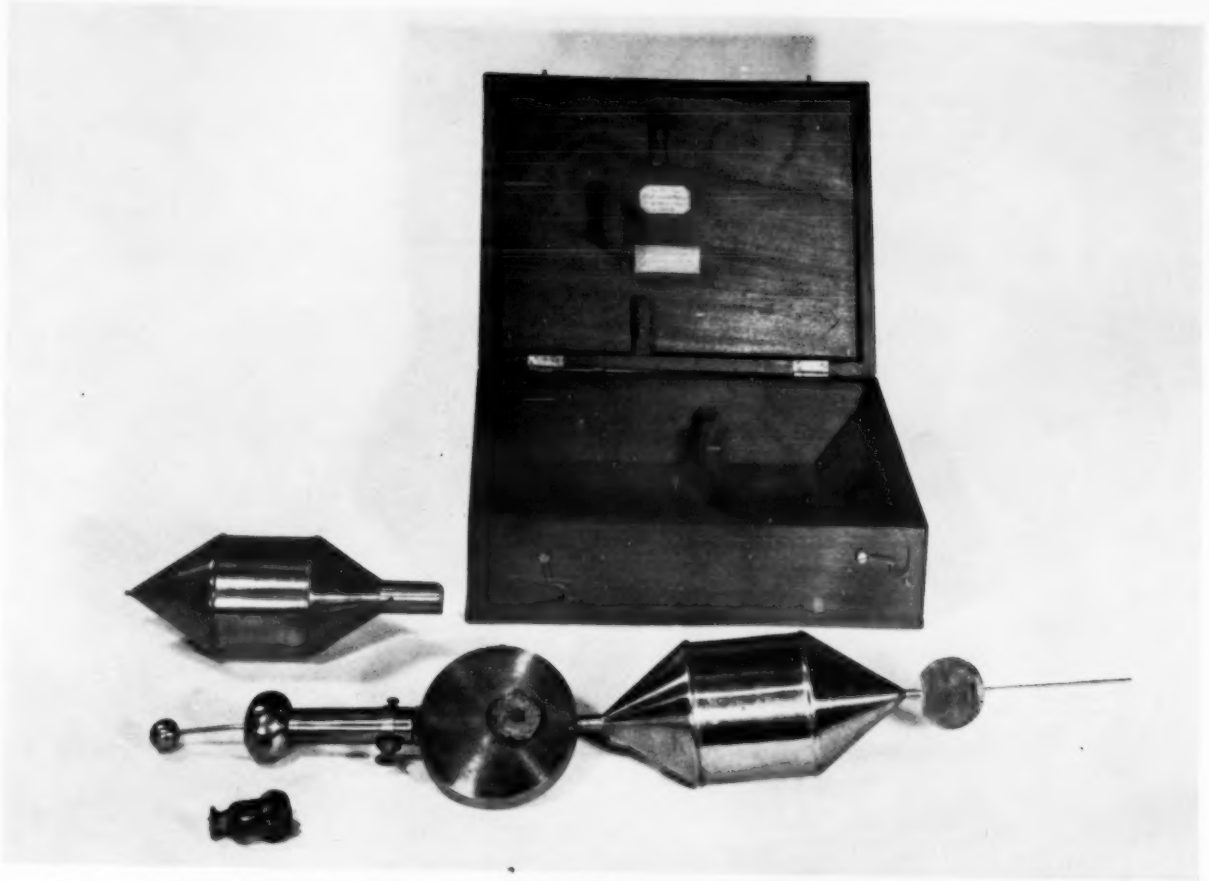

FIG. 3. Luiscius' sounder (1805) in an example presented to the American Philosophical Society by Thomas Jefferson. The instrument is a model of the commercial sounder. As shown assembled the parts are (left to right) the float-releasing trigger and weight, the odometer, the float, and the indicator for finding the float on its return. The extra float shown can be attached directly to the weight, in which case it constitutes a simple instrument like that proposed by Hooke in 1667. (From Luiscius.) Reproduced by permission of the American Philosophical Society.

return of the fruit (to the surface) in different waters the question is answered.[3]

This by-the-way application of experimental science to a problem somewhat remote from the principal interest of the investigator was typical of science from this time through the end of the 19th century. It appears to have had two interesting consequences: (i) the continual complication (if not improvement) of instruments through their modification in accordance with new scientific discoveries, and (ii) the accumulation of a considerable literature on certain instruments for which there was long little actual demand. The subsequent history of sounding instruments exemplifies both of these consequences.

Although the determination of oceanic depths was not a very lively scientific question prior to the last half of the 19th century, we find that new instrumental techniques were consistently brought to bear on this as on other problems of applied physics. A century after Cusanus, Puehler made the water clock itself (with which the operation was timed) a part of the apparatus, the amount of water *entering* being a measure of the depth.[4] In 1691, Robert Hooke, who re-invented the line-less sounder in the following century, declared that he found unsatisfactory the method of timing the return of the float, and proposed to incorporate in its body a propeller-driven odometer from which a direct reading of the depth could be obtained.[5] This modification, applied to the lead and line as well as to the line-less sounder, was altogether the most persistently recurring sounding invention through the 19th century, although there is scant evidence that it was much depended upon by those actually engaged in sounding.[6] The pneu-

[3] *De staticis experimentis,* 10th of 16 unnumbered pages. Bound with M. Vitruvius, *De architectura,* Argentorati, G. Machaeropioeum, 1543. An English translation has been published in *Ann. med. Hist.,* 1922, *4,* 115-135. This work was the fourth of four papers by Cusanus, called 'Idiotae libri quatuor,' and first published in 1476. There is an annotated German translation by Hildegund Menzel-Rogner, *Der Laie über Versuchen mit der Wage,* Leipzig, 1944.

[4] Puehler, Christoff. *Ein kurtze und grundliche anlaytung to dem rechten verstand Geometriae.* Dillingen, 1563, pp. 65 ff.

[5] Derham, Wm. *Philosophical experiments and observations of Dr. Robert Hooke.* London, W. and J. Innys, 1726, pp. 225-30.

[6] About half of the sounding instruments patented in Great Britain and the United States in the 19th century seem to have involved the odometer. The British patentee Edward Massey, the most persistent inventor in this field, held six patents on various versions of an odometer attachment for the lead and line. His is the only sounder of this type for which I have found evidence of use. He reported its adoption by the Royal Navy about 1823 (*Encyclopedia Britannica,* 6th ed., Edinburgh, 1823, art. "Sounding"), and it was part of the Navy's exhibit at the South Kensington exhibition of 1876 (*Catalogue of the special loan collection,* London, Spottiswoode for HMSO, 1877, p. 736). Although it was designed for navigation, J. Richard reported in 1907 that it was very good for depths of about 3,000 meters (*L'Oceanographie,* Paris, 1907, p. 18).

matic and hydraulic studies of the 17th century led to the development of the mercury manometer by Stephen Hales in 1727 and its substitution for the odometer in the line-less sounder in the following year.[7] Subsequent attempts to measure depth through pressure included that of Lord Kelvin (1878) to measure the degree of entry of sea water into an inverted air-filled tube through the color change induced in silver chromate.[8] The universality of the impact of the 19th century discovery of electromagnetism is reflected in the introduction of an electromagnetic sounder by one of the principal telegraph inventors, Alexander Bain, in 1844.[9] Ten years later an American patentee had proposed the conversion of the line-less sounder into a sonic instrument through its adaptation to the firing of an explosive charge.[10]

These improvements of the sounding instrument were aimed at deep-sea sounding, in most cases through the modification of the line-less sounder. The majority of the inventors were professional scientists, and most of them were aware that they were not the first to propose an instrument of this type. But few, if any, were aware of the extent of the history of this instrument. A less than exhaustive search has revealed references to the introduction of Cusanus' line-less sounder either in its simple form or with the addition of an odometer or manometer for direct reading, on 16 occasions during the four centuries prior to 1866.[11] Yet none of

7 Desaguliers, J. T. and Hales, S. *Philos. Trans.*, 1728, *35*, 559 ff. The float carries a mercury manometer communicating with the surrounding water. Honey is placed in the tube above the mercury to leave a mark at the point of greatest pressure. This instrument (see Fig. 4) represented an attempt to adapt to this purpose the "gage for estimating pressures" described in Hales' *Vegetable statics* (1727).

8 U. S. Patent 210067 (1878). Patented in England in 1876. Although this was the principal claim in this patent, a claim was also made for the hoisting mechanism. The Thompson sounder which was the basis of later instruments by Sigsbee and others featured the use of this hoisting mechanism with a wire line. The use of the chromate tube was abandoned.

9 British patent 10,450 of 1844.

10 U. S. patent 11,001 (1854), to C. F. Brown. This consisted of a weighted explosive charge with an igniter which fired on contact with the bottom. The interval between its entry into the water and the sound of the explosion was to be timed with a stopwatch.

11 As follows:

(1) Nicolaus Cusanus, mid-15th century, as cited above.

(2) Olaus Magnus, *Historia de gentibus*, 1555, cited by F. M. Feldhaus, *Die technik*, Leipzig u. Berlin, 1914, art. "Lot."

(3) Puehler, mid-16th century, as cited above.

(4) Alberti, cited by Murray, J., *Depths of the ocean*, London, 1912, p. 2.

(5) Sir John V. van Berg, 1636, *Abridgement of specifications relating to optical . . . instruments*, London, Office of the Commissioners of patents for invention, 1875, p. 1. This patent, the first listed in the class "philosophical instruments," is for "diverse

them appear to have been used extensively, if they were used at all, on the occasional oceanographic ventures of this period.

I have found no record prior to the 19th century of an improved sounding instrument designed for the purposes of the navigator. Thereafter, this was the purpose of the majority of the sounders *patented* in Great Britain and the United States; but far from contributing even incidentally to the development of deep sea sounding, they consisted in general of adaptations to the lead and line of certain features of the line-less sounder, notably the addition of the odometer or manometer for direct reading.[12] Yet the solution to the problem of oceanographic sounding, which finally evolved in the later 19th century, seems to have been ar-

mechanicke instruments and frames operating by weights," one of which is described as capable of sounding.

(6) M. Mersenne, *Cogitata,* Paris, 1644, cited by Feldhaus, *op. cit.*

(7) R. Hooke, 17th century, as cited above.

(8) Molinelli, *Acta Inst. Bono.,* T. 5, Pt. 1, p. 290, cited by Luiscius (See (11) below).

(9) J. T. Desaguliers and S. Hales, 1728, as cited above.

(10) Charnock-Greenstreet, *Repertory of arts and manufactures,* 1795, vol. 2, p. 180.

(11) A. van Stirprian Luiscius, *Beschrijving van een zeepeiler of bathometer,* s'Gravenhage, 1805. Luiscius' instrument (see Fig. 3) is a mechanically refined version of Hooke's.

(12) M. Faye, *C. R. Acad. Sci. (Paris),* 1851, *32,* 65-68. It is not clear whether or not Faye was acquainted with earlier line-less sounders. He may have been, since he proposes an improvement on them, the use of an oil-filled float communicating to the outside. His purpose is to prevent the collapse of the float at great depths.

(13) James P. Joule, *Practical Mechanic's Journal,* 1851-1852, *4,* 171. Joule, who knew of "numerous" earlier sounders of the same type, is attempting to improve on Faye by making the float of gutta percha instead of copper, giving it a lower specific gravity and hence a faster rising time. Joule was concerned with the defective soundings of oceanographic expeditions, which were becoming more numerous in his time, while still depending on the simple lead and line.

(14) H. Jouan, U. S. Patent 22,877 (1859).

(15) S. E. and G. L. Morse, U. S. Patent 56,436 (1866). This consisted of a glass tube, one end extending beneath the mercury surface in a jar partly filled with that liquid, the other end communicating with a bladder filled with water. The whole was attached to a line-less sounder of the type of Cusanus. Upon immersion the water is forced out of the bladder into the jar, in proportion to the pressure, and hence to the depth. It is trapped within the jar by the mercury and can be measured upon recovery of the float.

(16) H. Flad, U. S. Patent 126,795 (1872). This is concerned with the same problem as the sounders of Faye and Joule, the prevention of the collapse of the float.

12 My search for patented sounding instruments has been limited to those conveniently indexed, in Great Britain from 1617 to 1852, and in the United States from 1790 to 1873. The earliest British patent for a sounding instrument, after that of van Berg in 1636 (see note 11 above) was issued in 1802 to Edward Massey, for the addition of an odometer to the lead and line (see note 6 above). The earliest U. S. patent was issued in 1837 to the prolific John Ericsson, for a manometer in which water was trapped and measured. This, too, was to be attached to the lead and line. Most of the 13 subsequent British patents (to 1852) and the 14 U. S. patents (to 1873) were for the application of an odometer or a pressure sensitive device to the lead and line, for the purpose of navigational sounding. No British patents were issued for line-less sounders, but four were issued in the United States, as has been indicated above in notes 10 and 11. All these were for oceanographic sounding.

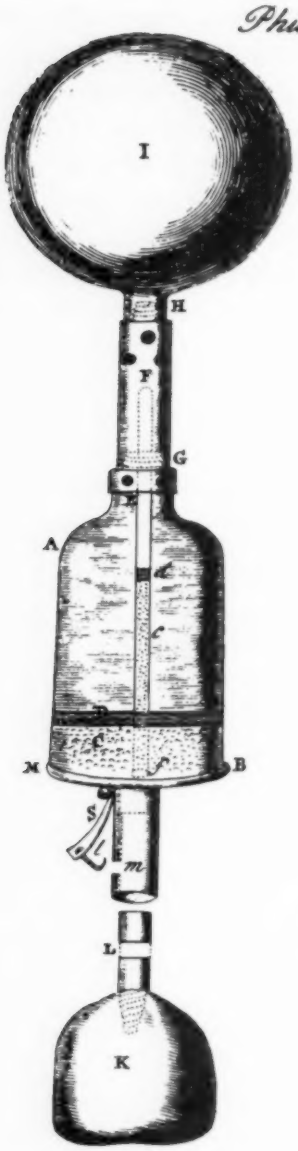

FIG. 4. The sounder of Desaguliers and Hales (1728). Between the weight and float it has a bottle containing a mercury manometer. There is a layer of honey above the mercury to leave a mark at the point of maximum pressure. (From *Philos. Trans.* 1728, *35*, p. 535.)

rived at through the improvement of the conventional lead and line.

The development of an effective instrument for oceanographic sounding was accomplished by an intensive effort during the period 1850-1880, inspired by the rise of a systematically pursued science of oceanography in alliance with a new technology, submarine telegraphy, which was equally interested in deep sea sounding. It is difficult to assign priority to either enterprise, as each had been the subject of increasing interest since the end of the previous century, and they came to fruition at nearly the same time. The practicality of underwater telegraphy was demonstrated in 1838, and the company for the Dover-Calais line was organized in 1845. Some attempt at systematic oceanographic exploration was made by both British and American expeditions in 1839, and by 1842 M. F. Maury had begun his career as the moving spirit of American oceanography.

In undertaking the collection of data for his chart of Atlantic depths (published in 1854) Maury soon encountered the defects of the lead and line, and a period of experimentation brought about the development of an improved instrument by an associate, Midshipman J. M. Brooke.[13] Brooke's sounder featured the adaptation to the lead and line of yet another feature of the lineless sounder, the detachable weight, but for quite a different reason. It facilitated both the recognition of bottom-contact and the raising of the line and was used extensively not only for the soundings published in Maury's Atlantic chart of 1854 but in those used in laying the first Atlantic cable. The weight-releasing feature was retained in the improved versions of this type of sounder by Kelvin (1878), Sigsbee (1880), and Lucas (ca. 1880), whose improvements related to the substitution of wire for rope line and to the application of steam power to raising and lowering the gear. It was, therefore, the traditional lead and line which gave the solution to deep sea sounding.

The problem of oceanographic sounding had been "solved" by the lead and line sounders of Brooke, Kelvin, Sigsbee, and Lucas, in that they were actually extensively used, and provided data of accuracy commensurate with the precision of the science to which they were applied. Notwithstanding their replacement by echo

[13] Most authorities date the development of Brooke's sounder in 1854, but it must have been earlier as it was used in taking soundings for Maury's bathymetric chart of the Atlantic, published the same year. In 1860 Brooke patented a sounder of the type of Massey (see note 6).

sounding methods in the 20th century, they must be judged successful. But not so the line-less sounder. It can hardly be regarded as even temporarily successful or as significant in the history of oceanography. But may the exploration of its possibilities not have been an essential precondition to the development of a successful sounding instrument? Although it is not clear that they were conscious of it, the inventors of the line-less sounder began with the simplest solution to the problem. Against the failure of the instrument to give reproduceable results they brought to bear an astonishing range of scientific discoveries. Against its frequent failure to give any results at all they applied the expanding technique of the instrument-maker. When at last an urgent demand arose for an oceanographic sounding instrument, the possibilities of the line-less sounder had been thoroughly explored, and it is evident that this exploration was not irrelevant to the direction taken by the inventors who followed.

Perhaps the line-less sounder also has a "posthumous" significance, in what its history suggests as to the processes by which experimental science has been conducted. The appearance of the instrument in the 15th century provides yet another reminder of the medieval origins of "modern" science. The regularity of its improvement or reinvention over four centuries suggests the persistance with which the problems of science have been attacked, often, as in this case, with little regard for demand. And the application to its improvement of new discoveries and techniques from the whole range of modern science suggests the massiveness of the attack brought against such problems, especially in the 19th century.

The Little Ship of Venice—a Middle English Instrument Tract

DEREK J. DE SOLLA PRICE*

SECOND only to the much better known astrolabe, it is an obscure type of sundial that holds pride of place as one of the most ingenious and sophisticated mathematical artifacts of the Middle Ages. This portable dial, telling time from the altitude of the Sun and adaptable for all places of whatsoever latitude, was curiously named the Little Ship of Venice *(Lat.* Navicula de Venetiis) by virtue of its distinctive shape. It is a crescent or lune, lying with its horns pointing vertically, and with each horn surmounted by a ship's forecastle; in the center is a pivoted mast which carries a little slider to which a plummet is attached. A bead or knot in the plummet thread runs over scales in the lune from which the time of day can be read after the dial has been aligned by holding it up so that the Sun's rays pass through a pair of pinnules drilled through the forecastles. The theory of the instrument and its manner of derivation, closely linked with the Universal Rectilinear Dial, popularized by Regiomontanus in the 15th century, have been very adequately treated by Fuller.** For our present purpose it is sufficient to remark that all such geometrico-mechanical computing devices, especially those based on methods of spherical projection, are ultimately Hellenistic in origin, being attested in the *Planisphaerium* and *Analemma* of Ptolemy and harking back to the presumed invention of stereographic projection by Hipparchus.

Like the astrolabe, the Little Ship is not known from any precise literary reference or extant artifact dating from classical times, but only from medieval Islam. The prototype is perhaps the instrument described by Sédillot† as the *zaourakhi* (lit. small ship) which places it within the tradition that includes also a host of other time-telling devices, planetary equatoria like those of the Alfonsine *Libros del Saber,* and computing plates like that of

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** Fuller, A. W. Universal rectilinear dials. *Math. Gaz.,* 1957, *41,* 9-24.

† L. Sédillot, Mémoires sur les instruments astronomiques des Arabes, Paris 1841, p. 182. There seems to be some confusion between the navicula instrument and one of the many variants of multiple retes for astrolabes, in this case one with a set of arcs resembling a ship. From Sédillot's fig. 89 it is clearly the navicula that is intended.

al-Kāshī. Why does the Little Ship make its entry into western Europe through the port of Venice? It was certainly an excellent point of arrival for something of arabic origin, though one might alternatively suppose that there was something about the shape of this instrumental ship that recalled some special Venetian craft. It has, unfortunately, become a baseless legend that so many of these medieval (and renaissance) sundials and astrolabes and other instruments were used on board ship for navigational purposes. So far as is known, to the contrary, the greater number of them were used only by landlubbers, and the navigators relied on rules of thumb, observations without benefit of instrument, and only in later times, the compass, sounding line and glass, and perhaps the nocturnal, to guide them. The case of this Little Ship probably also follows the majority rule of use by land alone, but in this instance, because of its name and history, one might be tempted to make an exception and suppose, alas unprovably, that it was some Arab navigator who carried the sundial into Venice and thence into the rest of medieval Europe.

At all events, the Latin text, describing the construction and use of the *Navicula de Venetiis,* is known in several 14th century copies, notably at Oxford where the Merton School of astronomer- and mechanician-physicians paid so much attention to instrumental methods. Their appearance there leads one to suppose that this text, like so many of the other Merton texts on instruments, entered from Spain with the Alfonsine Tables at the beginning of the 14th century rather than through the mediation of an Arab in Venice. This text has been edited by Gunther* from MS. Bodley 68, a late 14th (or early 15th) century corpus once belonging to Chaplain John Enderby of Louth and containing also descriptions of such other instruments as the *Annulus* of John of Northampton, a Sinecal Quadrant, and Chaucer's *Treatise on the Astrolabe.* In passing, Gunther conjectures on the basis of library record of 1622 by T. Allen that an otherwise unknown author, John Slape, may have been responsible for a work entitled *De compositione navis, quadrantis et cylindre,* and thereby perhaps the originator of this Latin text; there is, as yet, no evidence to confirm this, and the presumption must be that the Latin text is more propably an amended version of some Arab progenitor.

At the end of the Middle Ages and during the Renaissance the Little Ship appears to have remained on the list of exotic varieties

* Gunther, R. T. *Early science in Oxford,* Vol. II, Oxford, 1923, pp. 40-41, 375-379.

of sundial, but only just. Extant examples are perhaps more rare for this than any other variety of portable sundial. One example, in the Museum of History of Science, Oxford, and said to be German *ca.* 1450, has been reproduced by Gunther *(op. cit.,* p. 41); another dated 1620 and signed S F (? Samuel Foster, Professor of Astronomy at Gresham College), is in the Whipple Museum of the History of Science at Cambridge. The variant placings of the scales, noted by Fuller in his theoretical discussion, are referred to in the manuscript texts as alternative forms of the device. Other examples are mentioned by Zinner,* including one made by Georg Hartmann in 1527, and another by Arscenius in 1581.

It is remarkable that vernacular writers on science in England during the 14th century seem to have been preoccupied with instrumental tracts. Chaucer's *Treatise on the Astrolabe* has long been well known, and the present author has demonstrated that a Middle English Treatise on the Planetary Equatorium must be associated with it.** We now present yet another treatise on an instrument, this time without direct Chaucerian connections, though written at much the same time and with the same style and dialect. It seems to be a direct and rather literal translation (though perhaps with a few original insertions) from the Latin text, using a version similar to but not identical with that edited by Gunther.

This anonymous Middle English treatise on the design and construction of the Little Ship of Venice occurs, without title and curtailed by a lost folio of any *explicit* there might have been, in the Trinity College, Cambridge, manuscript corpus, o.5.26, dating from about the last quarter of the 14th century. It is a magnificent and large compilation, in a single well-formed hand, containing translations of several astronomical and astrological texts into English; interspersed are several sections that seem to be original compositions in this language. The treatise in question occurs after a section of translations and originals concerned with the astrological effects of great conjunctions of Saturn and Jupiter (it is stated that one should take place in 1405) and a few paragraphs of "fill in" dealing with the right time for sowing seeds and planting trees. The treatise here edited begins on the top of f.121.r., is written like the rest in two full columns to a page, and continues without break to the foot of f.122.v., breaking off there in mid-

* Zinner, Ernst. *Astronomische Instrumente des 11.bis 18.Jahrhunderts.* Munich, 1956. pp. 110, 116, 613.

** Price, D. J. *The equatorie of the planetis,* Cambridge University Press, 1955.

sentence with only a catch-word at the lower corner of the page to continue. The folio that should follow is lacking. The next two folios are occupied with a pair of full-page diagrams showing the instrument. These in turn are followed by a *New Theorik of the Planetis,* the opening chapter of which I have already edited in my *Equatorie,* pp. 197-203.

In the following diplomatic transcription of the text we have followed the same rules as previously, bowing only to typographical exigencies which seem to make it wise to substitute a *th* for the old letter *thorn;* the substitution, here italicized and not abbreviated otherwise in the manuscript is hence always recognizable. The *yog,* more difficult of substitution, is retained as ȝ. I should like to take this opportunity of thanking my research assistant, Miss Joy Day, for making the initial transcript of this and other texts from the Trinity College corpus.

Finally, I should like to offer this paper in all warmth and friendship to my distinguished colleague, Dr. Bruno Kisch, enthusiastic collector and connoisseur of the artifacts of science.

TEXT

f.121.r. To makynge of *th*e lytel schippe of venyse.*th*re instrumentes[1] at *th*e leste be*th* ful necessarie whiche schul be made Take a Compas & open *th*e fete to *th*e mesure of half a fote.[2] & pricke *th*re poyntes truly into *th*e tr*i*angle in *th*re plates of latou*n*[3] signynge or markinge *th*o poyntes w*i*th *th*re lettres a.b.c/. And *th*an putt oon fote of *th*e compas.in *th*e poynt of .a. & w*i*th *th*at o*th*er fote discreue a bowe fro*m th*e poynt of .b. til into *th*e poynt of .c. & wh*a*n *th*is is made in *th*re plates.go aȝen to *th*e firste.And fro*m th*e poyntes of b.c. drawe *th*ou lynes to *th*e poynt of a & so *th*ou *hast th*e sixte p*a*rtie of *th*e c*e*rcle.*th*an diuide *th*ou *th*e bowe of .b.c. into .6o. "p*a*rtyes" euene.of whiche *th*e XXIIII.degre[4] fro*m th*e angle or corn*e*r.of b. & alle o*th*ere fro*m* hit til into *th*e angle of .c. schul haue her lynes til to *th*e centre of .a. of o*th*ere degrees til to *th*e firste lyne.which is *th*e lyne of declinacio*un* it suffise*th th*at *th*e fi*fth*e degre haue his lyne to *th*e centre of .a. and wh*a*n *th*is (∧ is) done raise vp *th*e lyne by *th*e riȝte or euene angles.fro*m th*e myddel poynt of *th*e lyne of

[1] Instrument is here used in the special sense of a portion of an instrument; the three parts make up the complete whole.

[2] The device, as so described, is considerably larger than either of the extant examples—approximately twice or three times as big.

[3] Latoun (latten) is brass, as distinct from bronze.

[4] The use of roman numerals instead of the arabic elsewhere is unusual. The Latin text has arabic numerals throughout.

.a.b.til into *the* poynt of .c. And *than* putt *that* oon fote of *the* compas meuable *in the* poynt of .a. & *that other* fote in *the* fote of *thilke* lyne ortogonali*ter* vpri3t.& drawe a litel bowe til into *the* lyne of declinacio*un* vppon *the con*tact or touchi*n*ge of which raise *thou* ano*ther* lyne ortogo*nali*ter wi*th* his bowe as ra*ther*.& so of o*there* as many as *thou* wolt/ for more schippes or lasse.& *thus thou* hast declinacio*un* of *the* su*n*ne & *the* degrees of latitudes sufficient for al *the* er*the* of gode habitacio*un*/who *that* wole adde moo degrees for fer*ther* p*ar*tyes of *the* er*the* adde he in *the* name of *the* lord.:-

And whan *this* is done.it folewi*th* of o*there* instr*u*mentes for figures of signes ra*ther* bigu*n*nen in whiche *thou* schalt make a lyne fro*m the* centre of .a. by *the* myddel of *the* bowe of .b.c/. til to *the* ter*me* of *the* plate *that* is cleped *the* equ*i*noccial lyne.*than* take *thou* wi*th the* Compas *the* declinacio*un* or bowinge of *the* su*n*ne *that* is to wete *the* space of .24. degrees of *the* ra*ther* instrument/.& *thou* schalt poynte hit or pricke hit truly in eu*er* ei*ther* p*ar*tie of *the* equ*i*noccial in *the* bowes whiche poyntes be*th* cleped solsticial poyntes.vppo*n* whiche poyntes *thou* schalt make an hid lyne fro*m that* oon p*ar*tie of *the* plate into *that* o*ther*.& *thus thou* hast in *the* equ*i*noccial twey int*er*seccio*un*s or entrekittinges-whiche be *the*i signed w*i*th lettres .d.e. *than* putt *thou that* oon fote of *the* compas in *the* poynt/of .d. & w*i*th *that* o*ther* fote *thou* schalt forme an half cercle.fro*m that* oon solsticial poynt/.til into *that* o*ther*. And whan alle *these* be*th* made in eu*er* ei*ther* instrument/Take oon of *these* by which *the thr*ede w*i*th *the* knott be gou*er*ned.& putt on fote in *the* poynt of .e. & meue *that* o*ther* fote til to *the* latter p*ar*tye of *the* half c*er*cle w*i*th which fote lede *thou the* circu*m*ference fro*m that* oon p*ar*tye of *the* hid lyne til into *that* o*ther*/3itt
f.121.v. *the* fete of *the* compas not/meued. take| *thou* ano*ther* instr*u*ment/by which *the* maste of *the* schippe be gou*er*ned.& putt oon fote of *the* compas in oon solsticial poynt.& w*i*th *that* o*ther* fote make *thou* a poynt for *the* centre in *the* hidde lyne in which centre putt *thou* oon fote i*n*meuable.& w*i*th *that* o*ther* fote *thou* schalt lede *the* bowe from *the* solsticial poynt/til into *the* equ*i*noccial & vnd*er the* same forme *thou* schalt make a like bowe in *that* o*ther* p*ar*tie.*Than these* bowes w*i*th *the* vtter c*ircum*ferencial lyne of *that* o*ther* instr*u*ment/be *the*i diuided into .6. "p*ar*ties" euene. of whiche *the* twey p*ar*tyes biside solsticia.be *the*i diuided into *thre* euene p*ar*tyes/ Alle *the* o*there* p*ar*ties be *the*i diuided

into .6. euene partyes.And whan this is done.Alle these diuisiouns of euer either instrument/be thei led withynne til into the half cercle with a rule toward the centre of .d. And thanne be thei led with a rule & a skwyre from the half cercle in the bowe of .b.c/. in this maner.thou schalt make faste a rule vppon the plate without the bowe of .b.c/. with twey tanges.so that that oon side of the skwyre acorde to the rule & that other to the equinoccial.than meue thou the skwyre vppon the rule by the notes in the half cercle & note thou hem in the forseide bowe & that with hidde lynes withynne.that afterward thou myȝt with a rule note hem or marke hem more openly from the centre of .a. without § These figures of the zodiac.beth made after the forme of the astrelabie & not of the quadrant.[5] In the quadrant euerech degre holdeth his propre place.after that hit diuerseth or is in fernesse from the equinoccial.In the astrelabie the foure cardinal degrees holdeth her owne places & no moo.as here in these figures.othere degrees beth outdrawen from her places that is to wite in the figure of the mast/thei beth drawen withynne toward the equinoccial. In the figure of the threde & of the knott.thei beth drawen without toward the solsticial poyntes which cometh of the gretenesse of the paralelles.biside the equinoccial :-

After this thou schalt make oon or twey figures for the houre lynes to be founden in this maner.putt thou that oon fote of the compas in the centre of .a. of the firste instrument meuynge that other fote.til it were riȝt in the fote of the schorter lyne of latitudes by which mesure thou schalt discreue the riȝt lyne of the semicercle in the bak of the same instrument/And than lede thou a lyne from the centre into the myddel poynt/of .f./ Than euer either bowe in euer either partye of .f. be hit diuided into .6. parties.that is to wite into vi.euene houres.[6] of whiche the firste .4. be thei diuided into .3. euene parties the .5.[7] be hit diuided into twey euene parties & the .6. be hit not diuided. Than alle the diuisiouns be thei drawen togidre with euene lynes from that oon partie into that other. & thus thou schalt haue in the halfe dyametre verrey disposicioun of the houre lynes

[5] The point of this distinction seems to be that in the quadrant it is necessary to show the declinations of the Sun on a scale which is the projection of the ecliptic onto a plane. The divisions are thus uneven, being squashed at the outer, solstitial points. In the astrolabe, the zodiac may be divided equally, though in fact, in the normal form, they are not quite evenly of 30° each. *Cf.* H. Michel, *Traité de l'astrolabe,* Paris, 1947, pp. 63-64.

[6] Yet again one notes the use of a roman numeral.

[7] For .5. the Latin text reads *una.,* i.e., the first four sections are divided into three even parts (each), then one with two even parts, then the sixth without any such division. The discrepancy is thus only apparent.

f.122 r. for *the* schippe of *that*| q*ua*ntite § Efte go *tho*u aȝen to *the* firste instr*u*ment & putt *tho*u *the* fote of *the* compas in *the* centre of .a. as ra*ther*.& meue *tho*u *that* o*ther* fote.til it were riȝt in *the* fote of *the* more lyne of latitudes.And *than* the fete of *the* compas not meued putt *tho*u *that* oon fote in *the* poynt of .f. & where *that* o*ther* fote entrekitte*th* *the* firste lyne make *tho*u *there* a poynt/. & fro*m* *that* oon poynt into *that* o*ther* drawe *tho*u a lyne vppon which lyne take *tho*u *the* houre lynes for *the* more schippe In *the* same man*er* *tho*u schalt do of *the* *th*rid & *the* fer*the* lyne of latitudes for *the* fif*the* & o*there* more lynes.make *tho*u ano*ther* figure as ra*ther*.so *that* eue*r*ech lyne of latitudes haue in *these* figures a lyne like to hem silf/.*the* moost lyne only excepte

Whan *tho*u wolt compowne or make *the* schippe firste chese *tho*u to *thee* *the* lyne of latitudes.to *the* q*ua*ntite of *thi* schippe acordinge And *than* take *tho*u *with* *the* compas.*the* distau*n*ce or fernesse of *the* fote of hit fro*m* *the* centre of .a. by which mesure *tho*u schalt discreue *the* p*r*incipal *cer*cle of *the* schippe. levinge a lytel space *with*out for *the* figures of signes.By *the* centre of which.fro*m* oon p*ar*tie to ano*ther* *tho*u schalt lede *the* equ*i*noccial lyne.& from *the* same centre by *the* myddel of *the* half *cer*cle *tho*u schalt lede *the* p*er*-pendiculere lyne which schal be *the* lyne of *the* sixte houre.& *thus* *tho*u hast in *the* cercle *thre* inter*s*eccio*u*ns *in* whiche *tho*u schalt make.*th*re equ*i*noccial poyntes.*th*an go *tho*u aȝen to *the* lyne of latitudes & take *tho*u sutilly *the* q*ua*ntite of *the* bowe of hit which is declinacio*u*n of *the* su*n*ne.& *tho*u schalt poynte hit sixe tymes in *the* forseide cercle.*that* is. to wite *in* eue*r* ei*ther* p*ar*tie of *the* *th*re equ*i*noccial poyntes whiche poyntes be *the*i cleped solsticial poyntes.vppon whiche poyntes *tho*u schalt drawe tweyne *that* is to wete oon in *the* hynder p*ar*tie for *the* .12. houre of *the* nyȝt. ano*ther* *in* *the* for*ther* p*ar*tie.for *the* .12. houre of *the* day § *Than* take *tho*u *the* instr*u*ment made.for gouernau*n*ce of *the* *th*rede & *the* knott.vppon which *tho*u schalt make *the* schippe. so *that* centre acorde *with* centre.equ*i*noccial *with* equ*i*noccial solsticia *with* solsticials. And I schal holde *thus* *the* *th*rede *with* twey tanges.til *tho*u haue outdrawen truly *with* *the* rule toward *the* centre of *the* schippe *the* figure of signes fro*m* oon plate into ano*ther*.and *than* louse *thilke* plate fro*m* *the* schippe & ioyne *tho*u ano*ther* & note *tho*u or marke *the* figure of hit in *the* ne*ther* p*ar*tie for gouernau*n*ce of (*the* mast) by alle *thinges* as ra*ther* § Afte*r*ward *tho*u schalt make twey hidde lynes.fro*m* *that* oon p*ar*tie of *the* schippe into

that other that is to wete in euer either partie of the equinoccial oon from hit euendistaunt/ in whiche thou schalt note the houre lynes thus. Thou schalt seche in the semicercles rather made.the lyne like to this schippe in the contact/of which.vppon the moost lyne of the semicercle
f.122.v. which is in the schippe in the lyne| of the sixte putt the fote of the compas meuynge that other fote.til it were riȝt in the next interseccioun.which thou schalt poynte foure tymes in the hidde lynes that is to wete in euer either partie of the lyne of the sixte houre.In the same maner do thou of alle othere til thou haue fully done than drawe thou lynes vppon these poyntes for the houres lenger:for othere schorter that the latitudes of houres be seen better bifore othere Also of the lyne of latitudes be thei transferred into the maste the eres with the holes be thei euenely distaunt in al maner from the equinoccial. & so be thei raised aboue the solsticial poyntes.that thei lette not the threde the maste also in the equinoccio from euer either solsticial poynt/be thei euen distaunt.or yliche fer in al maner.

The forme of the newe instrument that is seide a schippe for euen houres oueral in al the erthe to be founden. In this instrument twey figures of the zodiak/at the leste beth necessarie that is oon bynethe for gouernaunce of the maste another in the forther partie of the threde & the knott[8]/ & than euermore it is for to worche with the riȝt hond & euermore toward the same partie it is to take the liȝte of the sunne And ȝif the thrid figure be putt in the hynder partie. thou may schape the instrument/to what partie thou wolt[8] // This figure conteyneth sixe signes & euerech signe conteyneth .30. degrees by the partyes of the same signe euenly to be diuided the extremitees of this figure ȝeneth solsticia.the myddel sothly equinoccia.In the lenger lynes from on heiȝ til to bynethe perpendiculerly drawen with crosses in the heiȝnesses of hem signed.of houre thei han bigynnynge & ende.// Of these lines thre beth poynted.that it be seen rather which is the lyne.of oon partie or of other. of whiche the myddel from euer either partie euermore is the sixte.euer either of the other tweyne from the neiȝer partie is the thrid & from the ferther partie it is the nynthe the schorter lynes sette bitwixe diuideth the houres.into twey parties or thre by degrees of latitudes In the maste thou myȝt schape the instrument to what euer regioun

8 This entire section from "& euermore it is" to "to what partie thou wolt" is omitted in the text edited by Gunther.

thou wolt/ Whan *thou* wolt fynde *the* houre of *the* day firste loke *thou that the* .12. signes be in *thi* kalender trewly sett. And *than* loke *thou the* distaunce of *the* sunne from equinoccio or solsticio in signe & degre & putt *there the* maste And *than* holde a *threde* vppon a like degre *that* is vppon *the* cerculer lyne vppon which *thilke* degre hath or schulde haue his contacte.ȝif he were *there*.aboutledinge *the* pynne in *the* coppe of *the* maste til *that the* knott were riȝt vppon *the* lyne of *the* (∧.12.) houre.And *than* is to take *the* liȝte of *the* sunne toward *the* same partie in which *thou* hast arayed *the* knott/so *that the* liȝt appere in *the* hole or in *the* ouerthwert lyne of *that other* table.& *the* knott schal schewe to *thee* in *the* firste siȝte *the* houre or a particle of *the* houre//ȝif *thou* wolt knowe *the* lengthes of dayes *that* is from risinge of *the* sunne into goynge doun put *the threde*

end of f.122 v. vppon *the* lyne or bitwixe| *the* lyne[9]

end of text

[9] The last two words transcribed occur as a catch phrase at the lower right corner of the folio. As has been noted, the closing paragraphs of the text have been lost in a missing folio. The end here corresponds to page 379, line 9 in the Latin version edited by Gunther. The missing folio would have provided enough space for this section on somewhat less than a full side, leaving one remaining side that may have contained a third diagram. Since the two extant diagrams are incomplete forms of those reproduced by Gunther (*op. cit.*, p. 38), it may be presumed that the lacking diagram was similar to that in Gunther, page 39.

Two Dental Advertisements on Mock-Bills

CURT PROSKAUER*

WE know of approximately a hundred coins and medals distributed by dentists of the Old and New World during the 18th and 19th centuries like "calling cards" for advertising purposes. They give the dentist's name and address, sometimes his portrait and his fees, and offer a unique approach to the history and cultural background of dentistry. A large number of these professional "store-cards" are to be found in the famous Bruno Kisch Collection of *Medicina in Nummis,* described by this writer in a detailed (still unpublished) article, "Advertising by Dentists and for Dentists on Medals." Now for the first time we have discovered two advertisements through another medium, not coins but imitation paper money, or mock-bills.

In the middle of the 19th century the American dentist Dr. N. B. Slayton of Madison, Indiana distributed one-hundred-dollar mock-bills,[1] advertising on both sides his practice and fees for various services. The front side, in the upper lefthand corner, bears the number "100" on a round flower field; the upper righthand corner, on a similar field, has a "C" (for *centum).* In the lower lefthand corner is a framed front view of the dentist's (?) face; in the lower righthand corner, in a similar frame, his wife's (?); at the middle of the lower edge, unframed and very small, is the face of a boy, supposedly the dentist's son. The upper half of the mock-bill, flanked on the left by the "100" and the words "GOLD, SILVER AND CHEOPLASTY," on the right by the "C" and the words "EVERY STYLE OF WORK, FROM FULL SETS TO ONE ON PLATE," shows a dental office. The practitioner stands beside the dental chair, extracting or filling an upper front tooth of a young woman patient, while her companion, dressed in crinoline and a lace cape, waits on a sofa in the background. An open instrument case is lying on a table in front of the chair (Fig. 1). Beneath the picture are the words: "DR. SLAYTON/SURGEON DENTIST,/ Will for ONE HUNDRED DOLLARS make the/ Bearer on DEMAND a good set/ of teeth. N. B. Slayton." In the lower lefthand corner, next to the portrait of the

* Charles H. Land Museum, Columbia University School of Dental and Oral Surgery, Medical Center.

[1] In the Robert Meibauer Collection (New York).

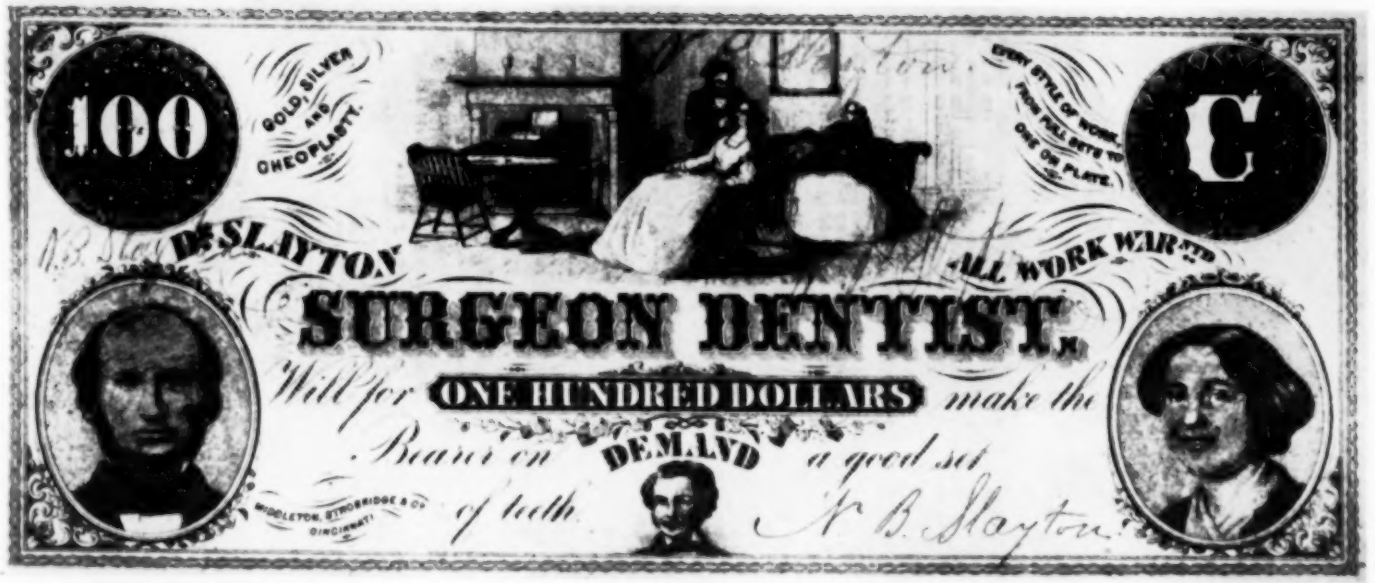
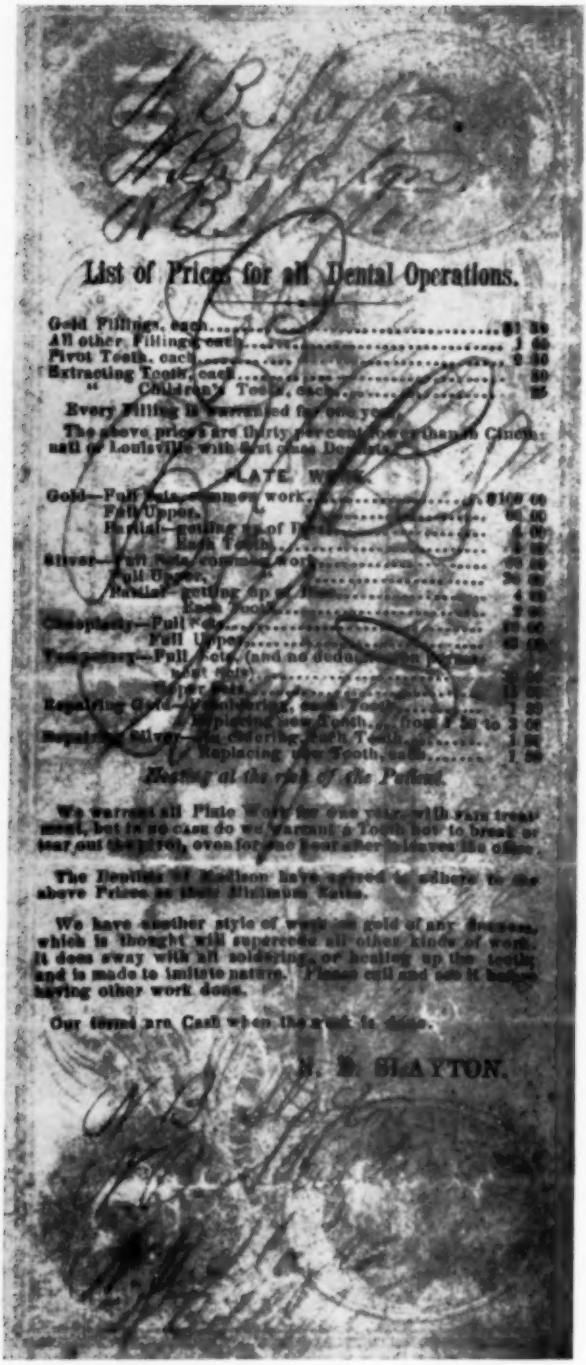

100
GOLD, SILVER AND CHEOPLASTY.
EVERY STYLE OF WORK FROM FULL SETS TO ONE OR PLATE.
C
DR. SLAYTON
ALL WORK WARR'TD
SURGEON DENTIST,
Will for ONE HUNDRED DOLLARS make the
Brant on DEMAND a good set
of teeth.
Dr B. Slayton
MIDDLETON, ESTABROOKE & CO CINCINNATI

FIG. 1.



List of Prices for all Dental Operations.

Gold Fillings, each $1 50
All other Fillings, each 1 00
Pivot Teeth, each 2 50
Extracting Teeth, each 50
" Children's Teeth, each 25

Every Filling is warranted for one year.

The above prices are thirty per cent lower than in Cincinnati or Louisville with first class Dentists.

PLATE WORK.

Gold—Full Sets, common work $100 00
Full Upper 60 00
Partial—getting up of Plate 4 00
Each Tooth 3 00
Silver—Full Sets, common work 60 00
Full Upper 30 00
Partial—getting up of Plate 4 00
Each Tooth 2 00
Chemplasty—Full Sets 75 00
Full Upper 40 00
Teeth Setting—Full Sets, (and no deduction for [illegible]
Best Sets 25 00
Other Sets 15 00
Repairing Gold—Remodeling, each Tooth 1 00
Replacing new Tooth ..... from $ 50 to 3 00
Repairing Silver—Remodeling, each Tooth 1 00
Replacing new Tooth, each 1 00

Testing at the risk of the Patient.

We warrant all Plate Work for one year, with PAIN treatment, but in no case do we warrant a Tooth not to break or tear out the PIVOT, even for one hour after it leaves the office.

The Dentists of Madison have agreed to adhere to the above Prices as their Minimum Rates.

We have another style of work on gold of any description, which is thought will supercede all other kinds of work. It does away with all soldering, or heating up the teeth, and is made to imitate nature. Please call and see it before having other work done.

Our terms are Cash when the work is done.

H. B. CLAYTON.

FIG. 2.

dentist (?), stands: "MIDDLETON, STROBRIDGE & C.º/ CINCINNATI," lithographers, engravers, and plate printers,[2] the manufacturers of the bill.

For historians of dentistry and of civilization in the United States at the middle of the 19th century, the reverse of this mock-bill (Fig. 2) is much more interesting, since it gives a "List of all Dental Operations" performed by Dr. Slayton.

In comparing these fees with those of today, we must consider how much a dollar could buy over a century ago. The eminent surgeon Samuel D. Gross, who started practising in Philadelphia in 1828, states in his autobiography:[3] "A chicken, for example, could be bought at six to ten cents, and the best quality of beef at about eight to nine cents. The ordinary fee for an obstetric case was five dollars among the poorer classes, and from ten to twenty-five among the wealthier and more influential." Beef, around 1840, was five and six cents a pound; fifteen years later—the time of Slayton's mock-bill—it had risen to twelve and fifteen. Rents had also doubled between 1840 and 1857, and nearly everything else in the same proportion, so that the cost of living was about double or treble what it had been.

Dr. Slayton asks $1.50 for one gold filling, for other kinds of fillings, $1.00—at that time only amalgam and Hill's Stopping (guttapercha with quicklime, powdered quartz, and feldspar, to which coloring substances may have been added) were available as filling material; he guarantees these fillings for one year. For a pivot tooth Slayton asks $2.50, for the extraction of one tooth 50¢, of one child's tooth only 25¢.

It is interesting to note that Slayton claims his prices are "thirty per cent lower than in Cincinnati [Ohio] or Louisville [Kentucky] with first class Dentists." This is undoubtedly a competitive reference to the extravagant habit of patients who traveled all the way to these distant cities (80 and 45 miles respectively from their home town, Madison) to obtain expensive dental treatment.

The second part of his "List of Prices," headed "PLATE WORK," gives the price of a complete set of gold dentures (upper and lower) as $100.00, silver, $60.00, both being "common work." A full upper denture in gold costs $60.00, in silver, $30.00. The "getting up of dies" in preparation for gold partial dentures is

[2] According to a letter from The Public Library of Cincinnati and Hamilton County, Ohio, the firm had the name of Middleton, Strobridge & Co. only from 1859 to 1864.

[3] Gross, Samuel D. *Autobiography with reminiscences of his times and contemporaries.* Philadelphia, W. B. Saunders, 1893. Vol. I, p. 153.

$6.00, each tooth, $4.00; in silver, "getting up of dies" is $4.00, each tooth, $2.00.

Of special interest in the history of dental prosthetics is the item "Cheoplasty full sets $80.00, a full upper denture $45.00." The word "Cheoplasty," which appears also in the upper lefthand corner on the front of the bill, was coined in 1856 by Alfred A. Blandy, M.D. and D.D.S., founder and editor of the Baltimore quarterly *The Dental Times and Advertiser.* Blandy invented a tin alloy for denture bases which proved easier to handle and more durable than the pure metal; he called it "Cheoplasty" and patented the substance, both process and name. The exact date of the appearance of the mock-bill is not known, but it must have been after 1856 and we can assume that it was probably lithographed between 1859 and 1864 since the firm which printed it bore the name used only between those years.

Regrettably it has not been possible to get any new information about the life of Dr. Slayton. We can gather something from his mock-bill and a little from a passage in the *History of Dental and Oral Science.*[4] He seems to have been mostly interested—as were many other dentists in an era ripe for inventions—in prosthetic dentistry. He experimented with gutta-percha for denture bases. These were first introduced in England around 1851 by Edwin Trueman, who called the process "auroplasty" since his finished bases were electro-gilded. In 1855 Slayton caught up this idea and brought out his "colored gutta-percha base" which was simply Trueman's base with another name. They were both formed of wire frame-work—gold generally—covered with gutta-percha. Trueman's was afterwards electro-gilded, while Slayton's was not. Although it had first been designed for permanent sets, a short period of experimenting proved it not entirely successful as such so that Slayton claimed value for it only in temporary dentures, a process which attained considerable popularity. Because, however, this method was not enduring, it had been very fast abandoned as a base.

After this digression, let us return to his List of Plate Work:

Temporary full sets $30.00, with the flat statement that "no deduction on permanent sets" will be given. Upper sets cost $15.00, resoldering each tooth on gold dentures, when these need

[4] Letters to the Historical Society of Madison, Indiana have not been answered, and with the exception of some sentences in *A history of dental and oral science in America* (prepared under the direction of the American Academy of Dental Science, Philadelphia, 1876, pp. 29-30), nothing is to be found about Slayton in dental literature.

repair, $1.50; replacing new teeth on gold dentures, from $1.50 to $3.00 per tooth. The same two items of repair on silver dentures cost $1.00 and $1.50 respectively.

Slayton warns that "Heating" of plates and teeth, which is sometimes necessary in repair work, and may damage the teeth or plate, is undertaken "at the risk of the Patient." He warrants all plate work for one year "with FAIR treatment" but in no case does he "warrant a Tooth not to break or tear out the pivot, even for one hour after it leaves the office."

"The Dentists of Madison have agreed to adhere to the above Prices as their Minimum Rates."

At the end of his price list, Slayton emphasizes the superior quality of his plate work with the words: "We have another style of work on gold of any fineness, which is thought will supercede all other kinds of work. It does away with all soldering, or heating up the teeth; and is made to imitate nature. Please call and see it before having other work done." As to payment of his fees, Slayton leaves no room for doubt. He concludes his list with the statement: "Our terms are cash when the work is done."

The other mock-bill advertisement was designed not by a relative unknown, like Slayton, but by the famous Paris dentist Antoine-Malagou Désirabode. This bill, which appeared in 1823, was sensationally ill-fated and, as we shall see later, its distribution was prohibited. Nevertheless, we know how it looked because Désirabode reproduced it in his apologia *Je ne puis me taire* (I cannot be silent) published in 1826 (Fig. 3).

The mock-bill (Fig. 4) is an imitation of a five-hundred-franc note with a different text, different ornamental border work, and different pictures from those of French legal tender of the period. The text inside the horizontal oval proclaims that complete dentures are made for five hundred francs and also offers Désirabode's mouth wash for the teeth.

In the middle of the top of the horizontal oval frame is the head of "ESCULAPE" set between two cornucopias, in turn flanked by two snakes, the misunderstood symbol of the god of healing. At the left end we see the moon looking out of the clouds, at the right, the sun shooting rays. In the center of the oval is a dressing-table with a mirror, at either side a semi-nude female reclining gracefully on the ground. Beneath this table is the morbid declaration that "Neglected teeth are punished by death."

JE NE PUIS ME TAIRE!

OU

MÉMOIRE

DE M. DESIRABODE, DENTISTE,

AU PALAIS-ROYAL, N°. 154.

A PARIS,

CHEZ DESIRABODE, DENTISTE, AU PALAIS-ROYAL, N°. 154;
ANTHELME BOUCHER, IMPRIMEUR-LIBRAIRE,
RUE DES BONS-ENFANS, N°. 34;
ET CHEZ TOUS LES MARCHANDS DE NOUVEAUTÉS.

1826.

FIG. 3.

The dentist's initial "D" and the year "1823" (when the mock-bill was designed) appear at the upper and lower edges of the moon's clouds and sun's rays. "DESIRABODE," in intertwined calligraphy, borders the lefthand curve of the oval.

In his pamphlet *Je ne puis me taire* Désirabode tells the story of his mock-bill and its consequences for him.

I intended to print the address of my practice on a new design and found it piquant to give to these store-cards the appearance of the 500 franc bill. When I say 'the appearance,' this means that my business card in all the minutest details was completely dissimilar to a real 500 franc bill. Since, however, I did not wish to offend the law, I put, with the consent of my lithographer, seven copies printed on paper and seven copies printed on

FIG. 4.

white satin before the administration of the Library. They retained them without giving me a receipt, which I could not get in spite of my request. When I learned that the Bank of France did not like my cards, I submitted, for the purpose of taking the edge off the matter, a sample to the head cashier of the Bank. He urged me to withdraw my business cards. I confess that I was very unhappy to be forced to desist from my purpose. The originality of my address cards seemed to me to be fitted for distribution in large numbers, to bring the visitors of Paris in this way to my practice, for those who don't know me have no reason to come to me rather than to my colleagues. This little charlatanism seemed to me very harmless.

It may be of interest that Désirabode, so he says, had not ordered more than four proofs of his mock-bills, not counting those the Library had received, and that not a single address-card had been distributed. He was all the more surprised, we can well imagine, to find that his house had been searched on 10 January

1823, like that of a traitor or counterfeiter. His apartment, his cupboards, his writing-desk, and his pocketbooks had been rummaged; what was worse, all this had been done by direction of the most dreaded police official, one assigned to pursue only the most dangerous criminals.

"Why this waste, why these many men who accompanied you? My neighbors have recognized you, the public has learned that you came to me; I am a lost man until it is known what was the reason you came to me. The rumour is spreading far and near," writes Désirabode, "that a police raid took place, so that I am busy receiving many of my alarmed friends, who come to ask an explanation of this strange event. I believe that I am bound by my reputation to give such explanation to the public."

Désirabode now gives a minute account of the whole series of unfortunate events, beginning with the conception of his advertising idea and ending with his accusation of his accusers. One of the main points in his defense is the fact that no one can mistake his mock-bills for real money. Text and pictures make this impossible. Désirabode remarks sarcastically that it is unfortunate that he is not able to attach to each copy of his defense pamphlet a genuine 500 franc bill as obvious proof for his assertion. He will, however, try to describe the differences verbally:

> The venerable head with the beard, at the top of the store-card, representing the Healing God Aesculapius, cannot be confused with the beautiful Goddess of Abundance, whom the Bank of France has chosen for good reason as its symbol. Alas! This symbol *suum cuique* does not belong to the whole world. Hippocrates is my patron, whom they should let me have, as I allow 'Abundance' to those who have chosen it as the object of their cult! On both sides of the bill of the Bank one sees two small figures: Mercury and, I suppose, Minerva. My Full Moon and my large Sun, have they any likeness to these two divinities of the Bank? The toilet table which is at the foot of my store-card, bears no more resemblance to the money-box of the real bill, than the name of Desirabode, written in large interlacing letters on the left margin of these cards, bears to the words 'Banque de France," which are to be read at the left margin of the real bills. The money-box on the bill is protected by the beloved god Mercury, holding his caduceus, and by the goddess of Wisdom, Prudence, whom one recognizes by the mirror and especially by her serpent. My toilet-table is supported by two nymphs, one of these offering the beholder a rose, the symbol of beauty, and the other a flask of the Eau Desirabode, so widely known for its beneficent and preservative qualities; less widely known, however, than the bills of the Bank, because its qualities have not the world-wide reputation they deserve, although it has been produced in the best possible way. But who leads me so far from the subject of my store-cards? I return to my subject and ask who, in the light of sober meditation, can find any relation between the following words:

INDUSTRIE FRANÇAISE

Palais-Royal,n°. 154,et rue du Lycée,n°. 19.

On établit des râteliers complets

pour

CINQ CENTS FRANCS.

approuvé par la faculté de Médecine. Eau Desirabode, pour les Dents,

Le Directeur de l'Établissement,

DESIRABODE.

Les Dents négligées sont punies de mort

BANQUE DE FRANCE

Création de an

Il sera payé en espèces à vue au porteur

CINQ CENTS FRANCS.

Le Caissier princip., Le Contrôleur,

DE CROUZAS CRÉTÉ.

MAILLARD.

Le Directeur

par autorisation du conseil général.

GARAT.

La Loi punit de mort les contrefacteurs.

The whole real bill is printed in a much larger type than my store-card. If we pay heed to thousands of other dissimilarities which are too numerous to specify; if we add to all that has already been said the differences between the engraving and the lithography, the differences between my paper and the paper which the Bank manufactures, and the transparent water-mark which contains the large, clearly visible words 'cinq cents francs'; if we consider the large stamp on the bills, which is not to be found on my store-cards, can anyone imagine that I have given any cause for sudden fear or approaching danger, to justify the cruel acts carried out against me?

The fits of rage to which Désirabode gives way in his pamphlet, his account of events, and his detailed description of the mock-bill, offered as proof of the impossibility of mistaking his store-cards for real money, his profound indignation—all these may have been a natural response to the unnecessarily brutal action taken against him. They may also, however, have been a very shrewd way to bring—instead of by means of the prohibited distribution of his mock-bill—the advertising of his practice to the masses, using for this purpose his sensational pamphlet, which he did not sell but distributed and in which he showed his planned mock-bill thus showing it unprohibited to the public. In any case, Désirabode displayed brilliance not only in the field of dentistry but in the field of effective advertising as well.

Désirabode was certainly one of the most famous French dentists of his time. In his book[5] on the lives and works of Parisian medical men, C. Lachaise, Docteur en Médecine de la Faculté de Paris, wrote (under the name of Sachaile) about twenty years after

[5] [Lachaise, C.]. *Les médecins de Paris jugés par leurs oeuvres, ou Statistiques scientifique et morale des médecins de Paris. . . .* Par C. Sachaile [pseud.]. Paris, Chez l'Auteur, 1845, p. 237.

the unhappy search of Désirabode's house in 1845 concerning this "Officier de Santé, Dentiste, chirurgien-dentiste du roi [Louis-Philippe], born in Agoulème in 1781, licenced in 1815," that

> Désirabode had reason to feel the honor of being of all the dentists of his epoch the one who achieved most in the popularization of his art, or, to express it better, the man who, on the one hand, succeeded best in showing the public the necessity for this art and, on the other, in giving his colleagues the benefit of his experience and knowledge. If the means he used to this end were not always scientific, they show at least extraordinary intelligence and great energy. He rendered the special service of making public what his colleagues confessed only to themselves, that the technical side of dentistry, the most profitable side of the practice of dentistry, requires adequate study, suited to its importance. The beautiful collection of dentures long exhibited by Désirabode to the visitors of the Palais-Royal is the most admirable evidence of his skill in this field of dentistry. He did not, however, neglect the other branches of dentistry. Together with his two sons—the one a "docteur en médecine," the other an M.B.—he published, in 1843, the *Nouveaux éléments complets de la science et de l'art du dentiste*[6] in two volumes. All the medical journals which reviewed this work stated, without exception, that it was the most complete and most scientific work published on the subject.

It was translated into English[7] four years later by the famous American dentist Chapin A. Harris, co-founder of the world's first dental college, Baltimore College of Dentistry, in 1840. Désirabode was also the first dentist to describe orthodontic methods and their danger when practised without the necessary knowledge, as was so common at that time, and he was the first to make root resections, in 1843.

Désirabode's success in science and practice, in writing and lecturing, and his appointment as dentist to the King indicate that this projected advertising campaign by mock-bill, although he gave it to be understood that the consequences might be fatal to his reputation, did not seriously influence the career of this unusual man.

[6] Desirabode, Chirurgien-Dentiste du Roi, et Ses FILS, Docteurs en Médecine. *Nouveaux éléments complets de la science et de l'art du dentiste, suivis d'une notice historique et chronologique des travaux imprimés sur l'art du dentiste depuis Hippocrate jusqu'à nous.* Paris, Béchet-Labé, 1843.

[7] *Complete elements of the science and art of the dentist. Followed by an historical and chronological notice of the works published on the dental art from the time of Hippocrates . . .* 2nd ed. Trans. from the French by Chapin A. Harris. Baltimore, American Society of Dental Surgeons, 1847. Five years earlier, in 1838, Désirabode had published his *Considérations anatomiques, physiologiques et pathologiques sur les dents de sagesse.* Paris, 1838.

A Golden Medal at the Jewish Museum

GUIDO SCHOENBERGER*

IN the Benguiat Collection, the oldest part of the Jewish Museum of the Jewish Theological Seminary, there is to be found a very unusual piece which is listed in the Catalogue[1] as a 'gold disk' and dated, according to the collector Mr. Benguiat, soon after the destruction of the Temple (Figs. 1, 2).

Actually it is a medal of pure gold, rather thinly beaten, circular in shape, 5.2 cm. in diameter (probably 5.5 cm. originally, but now worn down). It is stamped in a very fine low relief. On the obverse is represented a somewhat phantastic representation of the Temple at Jerusalem under a gable roof showing a setting of columns and arches which can be explained as a central window with entrance beneath, flanked by two windows right and left (see Fig. 3). The circular inscription in Hebrew framed by fleur-de-lis and pearl bands reads: "May Jerusalem the Holy City and the Temple be rebuilt and established soon in our days, Amen Sela." The reverse shows the seven-branched Menorah beneath a crown, also surrounded by circlets of fleur-de-lis and pearl bands, framing the Hebrew inscription: "Of beaten work shall the candlestick be made, his shaft and his branches, his bowls, his knobs and his flowers be of the same (Exodus 37, 17)."

Before discussing these representations in more detail it must be stated that at least two other similar examples exist. One is at the Musée Cluny at Paris. The second one was displayed at the exhibition, *Das Judentum in der Geschichte Schlesiens,* in 1929;[2] its present location is not known to me. The Paris and the Breslau examples are identical, yet somewhat different from the New York medal. Moise Schwab published a careful account of the Paris example.[3] It is also of gold, of the same size, 5.5 cm. in diameter, very thin and having on the obverse the representation of the Temple (Fig. 3). The beginning of the Hebrew inscription is identical to that of the New York piece: "May Jerusalem the Holy City and the Temple be rebuilt and established soon." The word

* The Jewish Museum, New York City.

1 *Proceedings of the U.S. National Museum* (Washington), 1901, *34*, pp. 740-741.

2 Hintze, Erwin. Katalog der vom Verein "Juedisches Museum Breslau" in den Raeumen des Schlesischen Museums fuer Kunstgewerbe und Altertuemer veranstalteten Austellung: Das Judentum in der Geschichte Schlesiens. Breslau, 1929, Nr. 460.

3 Les Medailles de la collection Strauss. *Rev. Etudes Juifs*, 23, 137.

for "in our days" is left out and instead the word "beshnath" ("in the year") is inserted after "beth hamikdash ("Temple") indicating that the three last words of the inscription ("teboneh" [rebuilt], "wethekonine" [established], "bimhiro" [soon]) contain a date. Since none of the letters is dotted, one must probably add up the numerical value of all the letters,[4] i.e., 457 plus 532 plus 252, totalling 1241. Schwab proposed to read 5241 instead, and thus arrived at a date 1481 CE. This is a tour de force which is neither historically nor stylistically justified.

If we admit that 1241 is actually a date, we are confronted with the problem of which calendar era has been used. Considering the wish expressed in the inscription, that the Temple may be rebuilt speedily, the sensible assumption is that the Era of the Destruction of the Temple[5] is meant. In this case one has to add 70—the year of the beginning of that era—to the given year 1241. The result would be the year 1310-1311 CE.

This date is supported by the stylistic aspect of the representations. The representation of the Temple displaying a mixture of gothic and oriental elements fits well in the end of the 13th or the beginning of the 14th century as do also the pearl bands and the abundant use of the fleur-de-lis bands which belong to the Middle Ages and flourished in the 13th and 14th centuries.

To determine the significance and the use of the medals we may first consider the reverse of the Paris and Breslau examples. Within a circular inscription, quoting the first words of each of the Ten Commandments, appear the angels Gabriel, Raphael, and Michael who are frequently represented on amulets. The amulet character is also shown by the fact that both the Paris and the New York examples are equipped like pendants with hanging devices.[6] Yet these devices, being apparently later additions, do not exclude another more important significance emphasized by the expression of Messianic Hope, indicating the intrinsic and primary importance of these medals.

It is very difficult to decide where these medals originated. Western Europe is not excluded, but I would suggest the Near East or even Jerusalem, where the strange and complicated mixture of forms could be explained best. Thus it might be justified

[4] In the Hebrew alphabet each consonant has a numerical value; these numerals are mostly, but not always, indicated by a dot above the letter.

[5] Franck, Edgar. *Talmudic and Rabbinical chronology*. New York, 1956, pp. 69 and 77.

[6] A comparable use of coins as amulets is found in the use of Shekels; see Bruno Kisch, Shekel medals and false shekels, *Historia Judaica*, 1941, *3*, 21.

FIG. 1. Front view (slightly enlarged) of gold disk in the Jewish Museum, New York. (Photograph by Frank Darmstaeter)

FIG. 2. Obverse of medal in Fig. 1.

FIG. 3. Medal in Cluny Museum, Paris (slightly enlarged).

to call them "Pilgrim Medals." Jewish pilgrims to the Holy City might have brought them home as a precious symbol of Messianic Hope and at the same time as a protective amulet.

Into this complex use and significance fits very well the representation on the reverse of the example in the Jewish Museum, New York, the seven-branched Menorah (Fig. 2). Being, as it were, the coat of arms of Judaism throughout the ages, it is at the same time a beautiful expression of Messianic Hope.

I must confess that I was fascinated by this representation because of its very outstanding character. Traditional in its five center branches, the Menorah is made excitingly unique by the formation of the two outer branches to the right and the left as flowering twigs woven into a grapevine design. The Menorah is described in Exodus as a tree with buds and flower chalices. Yet, I do not know of any other representation which so clearly as our amulet expresses the great equation: *the Menorah is the Tree of Life.*

And this, I think, is particularly appropriate on an occasion honoring Dr. Kisch!

Notes and Events

Edited by Dorothy M. Schullian*

Charles Singer, 1876-1960

One by one they leave us—Sarton in the spring of 1956 and Sigerist a year later, Francis in 1959 and Fulton ten months afterward on 29 May 1960, and now, so very soon, Singer on 10 June. These were the great, only two of whom had really arrived at the fullness of their years. We are thankful for what each has given, and we try to advance as best we can what they so earnestly forwarded through all the time of their service.

The career of Charles Singer is set forth in detail in the introduction to the two volumes entitled *Science, Medicine and History* which were published in his honor in 1953 and in the obituaries carried by the *British Medical Journal* of 18 June 1960 and *The Lancet* of the same date. He came well equipped to the study of medical history. With a family background of distinguished scholarship in Hebrew, possessed of a natural facility in languages which was sharpened by stays in localities as far distant as Abyssinia, Salonika, and Singapore, trained in the best traditions of University College in London, Magdalen College at Oxford, and St. Mary's Hospital at Paddington, amply experienced in the practice of medicine under a variety of conditions, and blessed with a devoted wife who is a scholar in her own right and who assisted him at every turn, he brought unusual capacities to the field the final choice of which was triggered for him by Osler in 1914 with the offer of a studentship at Oxford. The post was nominally in pathology, but there was a clear understanding that the bulk of his time would be devoted to historical research.

After that, all his many papers and books, numbering finally some five hundred, were concerned with historical subjects. In 1920 he transferred to University College, from which he retired in 1942 with the title of professor emeritus. In 1929 and in 1932 he served as visiting professor at the University of California. His four continuing sources of interest from the earliest years were Galen, Vesalius, Anglo-Saxon medicine, and early herbals. He could write with equal zest significant papers on microscopy or anatomy, general histories of medicine or biology, annotated translations of ancient authors. His talent in organizing and editing the work of others is abundantly demonstrated in the five volumes of *A History of Technology*, which he conceived when already in his seventies and lived to see successfully completed in 1958. National and international honors in the history of science and medicine were deservedly heaped upon him through the years. From its inception in 1946 he served as Consulting Editor of this Journal.

* Cleveland, Ohio.

In 1934 the Singers moved from London to the house in Cornwall from which they dispensed generous hospitality to their many friends. Here also they devoted themselves during the war years to the relief of victims of oppression, and when Harvey's old school at Canterbury was evacuated to Cornwall only a few miles away from them, Dr. Singer characteristically undertook to teach practical biology to the sixth form. The boys, as Dr. P. B. Poole relates in the *British Medical Journal* for 9 July, visited him once a week by car or bicycle; he set up a small laboratory in his house, collected dissecting specimens locally, and taught, before a log fire, much more than the subject in hand. "He augmented our packed lunches with fruit from his garden, and on special days we had tea in his library. Never once did he complain or report us if we slipped down to the local village for a glass of cider."

The generosity was present also in his treatment of older students and colleagues, his encouragement of the investigations of others, and his eagerness to help wherever possible. His youthful enthusiasm remained with him to the end. At the age of 83 he spoke of sending to this writer as a New Year's greeting "a dicky bird and a bit of holly." He was an eminent medical historian, but he was much more than that.

Waldie versus Simpson

The sad story of the scrabble for priority that constitutes so much of the early history of inhalation anesthesia has been resumed. At any rate, Scotland's leading newspaper, *The Scotsman,* recently published several letters on "the chloroform story." This correspondence started when one of *The Scotsman*'s staff reporters, writing about the town of Bathgate (*The Scotsman,* 24 November 1959) observed that Sir James Young Simpson (1811-1870) "discovered chloroform." This statement provoked a Mr. P. W. Brown to reply that "Sir James did not claim to have discovered chloroform, as it was a known substance for some time before he used it as an anaesthetic . . ." (*The Scotsman,* 1 December 1959). Mr. Brown then pointed out that

> The credit in connection with chloroform actually belongs to Dr. Waldie, of Linlithgow. On the south side of High Street, Linlithgow, opposite the Cross, is a tablet on the side of Waldie's residence bearing the following inscription: "David Waldie, Surgeon, L.R.C.S.E., and chemist. Member of Asiatic Soc., Bengal. B. Linlithgow 1818, D. Calcutta, 1889. A pioneer in anaesthetic research. To him belongs the distinction of having been the first to recommend and make practicable the use of chloroform in the alleviation of human suffering." Waldie's work is generally overshadowed by the performances of Simpson, and sufficient credit is not given to him.

A few days later, someone from Aberdeen who signed himself "J. B." said that

> In the Cossipore district of North Calcutta there is a plot of ground on which the Waldie chemical factory stood many years ago. The plot is still known as "Waldie." In the middle of the ground is a very old bungalow, and

it was here that Waldie, the chemist, lived and carried out his experiments which resulted in the discovery of chloroform. I was told this in 1923 when I first went to the district, and by men who had been there for many years; they all said it was quite certain that the first chloroform to be used for anaesthetic was actually made in this bungalow. (*The Scotsman,* 5 December, 1959).

The Scotsman's correspondence columns on 9 December 1959, carried two further letters about chloroform. The first came from Elizabeth B. Henderson, who wished to ". . . give a different version of the discovery of the use of chloroform to that in Mr. Brown's letter . . . ," and who went on to relate how

Sir James Simpson brought back from France some formulae or notes which he got from the widow of a French experimenter to produce some anaesthetic for use in midwifery. He gave these to William Flockhart . . . partner in Duncan & Flockhart . . . and asked him to work the notes out in their laboratory. David Waldie was in charge there of these experiments, which produced chloroform. W. Flockhart was husband of my father's sister, whom he married in 1860, so what I say is family tradition.

The second letter came from W. F. Howe, who said that

The Indian Jute Mills Association, on whose committee I served for a number of years, published a booklet in 1955 entitled "Fabric of Commerce," a centenary story of the Indian jute mills industry. Reference is made in the booklet to David Waldie as a keen research worker, particularly in anaesthetics, who worked on chloroform at the same time as Professor Simpson, of Edinburgh, with whom he corresponded on the subject. Many believe that David Waldie should have been given his share of credit for the ultimate discovery of chloroform, but he was averse to pressing his claim. . . .

Finally, on 31 December 1959, *The Scotsman* published a long letter from Nicholas Herdman, director and general manager of Duncan, Flockhart & Co., which cleared up much of the confusion.

Chloroform [he said] was first made in 1831, by the French chemist Soubeiran; and independently by the American, Samuel Guthrie. A purer form was made in 1832 by the German chemist, Liebig. The French chemist, Dumas, was the first to make pure chloroform, in 1834, and it was he who gave it that name. Chloroform was first used as an anaesthetic by the French physiologist, Flourens, who used it and proved its value in animal experiments. His findings were published in March 1847 by the French Academy of Sciences. About eight months later, in October 1847, David Waldie, a Linlithgow-born chemist, was on holiday in Scotland from Liverpool, his place of business. During that holiday he directed the attention of James Young Simpson to chloroform. In his own words (*The True Story of the Introduction of Chloroform Into Anaesthesia,* Linlithgow and Edinburgh, 1870) he wrote: "Dr. Simpson introduced the subject to me, inquiring if I knew of anything likely to answer (for anaesthetic purposes). Chloric ether was mentioned during the conversation, and being well acquainted with its composition, and with the volatility, agreeable flavour and medicinal properties of chloroform, I recommended him to try it, promising to prepare

some after my return to Liverpool and send it to him. Other engagements and various impediments prevented me from doing this so soon as I should have wished, and in the meantime Dr. Simpson, having procured some in Edinburgh, obtained the results which he communicated to the Medico-Chirurgical Society of Edinburgh on the 10th November, and which he published in a pamphlet."

Mr. Herdman then quoted the following important extracts from Barbara M. Duncum's *The Development of Inhalation Anaesthesia* (Oxford, 1947), pp. 173-176:

. . . Time passed and Simpson made no acknowledgement to Waldie beyond the single mention of him in the footnote to the published account of chloroform anaesthesia [Simpson, J. Y. *Account of a new anaesthetic agent as a substitute for sulphuric ether in surgery and midwifery.* Edinburgh, 1847]. As months stretched into years Waldie, and perhaps more particularly his friends and relations, came to believe that he had been the prime mover in establishing the anaesthetic use of chloroform and that, as such, he had been unjustly neglected.

Soon after Simpson's death in 1870, Waldie once more publicly drew attention to his share in the application of chloroform in anaesthesia by publishing a 'Re-statement' in which he wrote: 'The recognition which my share in the discovery has met with has been considered by many as inadequate; nor was it altogether satisfactory to myself. . . .'

After describing his recommendation of chloroform to Simpson and his own unavoidably unfulfilled promise to prepare and send a sample to Edinburgh, Waldie continued:

'When the news [of Simpson's anaesthetic use of chloroform] came . . . I felt pleased at the success of my recommendation, but was also mortified that from . . . unfortunate circumstances [the destruction of his laboratory by fire just previous to his interview with Simpson] I had not been able to do something in carrying it out. I had inhaled both nitrous oxide gas and ether vapours before, and felt interested in the enquiry; and have no doubt that if I had been in a position to prepare the Chloroform, I should at once have discovered its properties on my own person. But when the small pamphlet announcing the discovery was introduced to my notice, I was further disappointed, for all the acknowledgement made by Dr. Simpson of my suggestion was, that among chemists with whom he had conversed on the subject, Mr. Waldie first mentioned Chloroform as likely to answer, and this too was given not in the text, but in a footnote. I at once saw that this was well adapted, even if not intended, to lead to my share in the matter being altogether lost sight of; and the account of my recommendation as merely a matter *mentioned,* was a parsimony of acknowledgement for which I was not prepared. . . . As I did not wish to quarrel,' Waldie added, 'and did not feel inclined to go a-begging for more credit than those concerned were willing to give spontaneously, I made no remark on the subject. Some of my friends have considerably over-rated the importance of my share in the discovery, but this I have uniformly discountenanced. Willingly do I acknowledge that the discovery was Dr. Simpson's and the honour his due. All that I looked for was a distinct and honest acknowledgement that I had recommended or even suggested to him to try Chloroform. . . . His reputation cannot suffer by my getting credit for what I am justly entitled to, and that is all I ask; and I would willingly entertain the hope, that had he been still living amongst us,

and my claim been placed before him as it is now before the public, he himself would have admitted its justice.'

In fact, the credit which Waldie so much desired had already been freely given to him, if not by Simpson at least by others of equal reputation in the anaesthetic world, but because he [Waldie] had been working in India for many years he was possibly unaware of acknowledgements such as Snow's [John Snow, 1813-1858, a Yorkshireman and the first specialist anaesthetist]:

'Mr. Waldie, of Liverpool, had a greater share in the introduction of chloroform than Dr. Jackson [Charles Thomas Jackson, 1805-1880, an American chemist and geologist] had in the introduction of ether . . . for when he [Waldie] informed Dr. Simpson of the existence and nature of chloroform, he was able to give him, not merely an opinion, but an almost certain knowledge of its effects.' [Snow, J., *On chloroform and other anaesthetics*, London, 1858].

Towards the end of January 1847, Simpson began to use ether anaesthesia as a routine measure to relieve the pains of childbirth in his obstetrical practice. In this particular application Simpson was the pioneer, although in February Baron P. Dubois, in Paris, also began to use ether in labour. Their example was quickly followed by other medical men.

Mr. Herdman concluded his letter with the question "Where does my own company, Duncan, Flockhart & Co., Ltd., come into this?" and answered it as follows:

The records are scanty, but there is a strong oral tradition within the Edinburgh companies of Duncan, Flockhart & Co., Ltd., and of T. & H. Smith, Ltd., that Simpson, impatient for Waldie to send him chloroform, went to Thomas Smith . . . who, being occupied with other things that day, recommended him to try Duncan & Flockhart . . . The story continues that Duncan & Flockhart then asked Smith if he knew how to make chloroform, and that for some years after that Duncan & Flockhart bought their own chloroform from Smith before setting up their own plant.

One might also add that Waldie got fair treatment in H. Laing Gordon's biography of Simpson *(Sir James Young Simpson and Chloroform*, London, 1897, pp. 105-106) which states that "The suggestion to try chloroform first came from a Mr. Waldie, a native of Linlithgowshire, settled in Liverpool as a chemist. It was a 'curious liquid,' discovered and described in 1831 by two chemists, Soubeiran and Liebig, simultaneously but independently. In 1835 its chemical composition was first accurately ascertained by Dumas. . . ." [cf. the dates given in Mr. Herdman's letter].

What a pity that Simpson had Waldie's contribution embalmed in a footnote! Be that as it may, Waldie's small niche in anaesthesia's hall of fame has not been neglected and at least the correspondence in *The Scotsman* had the merit of being more restrained, interesting, and informative than is usual in public discussions of individual priorities and inhalation anaesthesia.

L. R. C. AGNEW

James Mackenzie and Cardiac Arrhythmia

In his fascinating story of auricular fibrillation, A. Bloomfield[1] said that James Mackenzie was "a keen but stubborn physician equipped with inadequate methods." It is parodoxical, however, that full knowledge has proved that the concept of auricular fibrillation was erroneous and that Mackenzie was right in complete detail.[2] Mackenzie was quite satisfied with the noncommittal terms "nodal rhythm" or "paralysis of auricle." He accepted the proof that it was possible to produce auricular fibrillation in dogs, but he was not convinced that it occurred in man and as time went on he became more dissatisfied.

I . . . unfortunately accepted the discovery [of auricular fibrillation] as settling the problem. . . . It is astonishing to find how obsessed clinical observers are by laboratory discoveries. . . . As years went on I became convinced that there was a great deal more in the matter than a fibrillating auricle. . . . It is one of the misfortunes of medicine that names are given to phenomena before their nature is understood. . . . Such terms are accepted as explanations, and such explanations are invariably wrong.[3]

There is another condition [auricular flutter] so closely allied to auricular fibrillation that it has in all probability the same origin.[4]

Mackenzie recognised that the electrocardiogram of auricular flutter was characteristic.[5] But this threw little light on the mechanism of the fibrillating auricle. He used the ECG a great deal on his patients, but no one could tell him with certainty what the tracings meant.[6,7] Nor could he believe in the existence of a circus rhythm:

Lewis, by an ingenious use of the electro-cardiograph, has obtained records from which he concludes that in auricular flutter of the human heart the contraction of the auricle is due to the presence of a contraction, or excitation wave, which passes continuously round the wall of the heart in a circle. This circus movement is evidently of the same kind as that which occurs in the jelly-fish. . . . One does not quite see how this occurs in the human auricle; the wall of the jelly-fish consists mainly of a network of nerve fibres, overlaid by a layer of muscle fibres—the impulse travelling round by the nerve network. Such an arrangement has not been found in the auricle.[8]

In the book which he completed shortly before his death, Mackenzie wrote as follows:

There are quite definite signs [in fibrillation] that the auriculo-ventricular node is carrying on, so far as possible, the function of the lost sino-auricular node.[9]

We are, therefore, bound to conclude [in flutter] that, between the sino-auricular node and the auricle, there lies a structure which, when the sino-auricular node ceases to exercise its function, takes up in this peculiar manner the function of starting and controlling the contraction of the auricle. The probability is that this structure, which has not yet been detected anatomically, is a portion of the genetic [conducting] system normally concerned in conducting the impulses from the sino-auricular node to the auricle.[10]

It is difficult after 50 years to realize how high Mackenzie's intellect towered over the field of medicine after the first edition of *Diseases of the Heart* had been published.[11] His terminology was immediately adopted and became currently used.[12] Later he often said that his own language had become universal but people seldom acknowledged it.[11] When Bloomfield wrote that Mackenzie had no idea of block in the conducting system,[1] he was using terms which Mackenzie had either invented or caused to be adopted.[12] But Mackenzie later called the system "genetic" instead of conducting; he believed that generation of impulses was more important than conduction.

Mackenzie was amused too when he found that for many his sole fame was the invention of the polygraph with which he had differentiated the innocent from the dangerous irregularities of the heart. He compared himself to a traveler who, returning from an unknown country, finds himself famous as the inventor of a new kind of boot.[13] Mackenzie was superseded by the electrocardiographic school, and the fourth edition of *Diseases of the Heart* went almost unnoticed. In this he corrected much outdated material which had been permitted to survive in the third edition.

Mackenzie's genius has triumphed after 40 years, and his criticism of auricular fibrillation and circus movement has been verified in detail by Prinzmetal and his associates.[2] Using high-speed X-ray cinematography plus the cathode-ray oscillograph, they observed the heart beats in slow motion and concluded that there was no circus movement. In both fibrillation and flutter the impulse arises from a rapidly beating ectopic focus. The conclusions of Prinzmetal have been confirmed, both experimentally and clinically, by Popesco and Enesco.[14]

Mackenzie's was a progressive intellect which was never satisfied with a new fact but used it only as a step to further discovery.[15] When he was at the height of his fame in 1919 he confounded his friends by retiring to a Scottish village to study symptoms by clinical observation. He had seen the confusion caused by too great reliance on mechanical methods. He took no pleasure in being acclaimed, by people who did not know him, as the founder of the "Mackenzie School of Neocardiology."[11]

Mackenzie could have said with William Bean, "We cherish hope that man will not be lost in a sea of confusion, utterly overwhelmed by the great surfeit of undigested facts, shipwrecked by an overweight of knowledge."[16] His recognition in 1892 that the auricle did not beat during an extrasystole[17] came close to what Bean described as the "highest creative intellectual activity, in which imagination fashions art or discovery."[16] As a research worker he was far above the mechanist level.

In his last few years Mackenzie went further and took on the role of a true prophet.[18] He was stimulated by his innate curiosity and sense of wonder and guided by his scepticism. Thus he rejected the honours of London;

his last six years were his most productive as he strove to conquer the basic laws governing vital activity.[18]

The warning of the *British Medical Journal* may yet prove prophetic: "He may have been right or he may have been wrong about his new principles; but Mackenzie had in the past an uncanny knack of being right. His earlier work was ignored for many years, and it is to be hoped that English workers will not ignore this later work, and will not leave it to be appreciated first of all in other countries."[19]

MICHAEL KELLY

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George Urdang, 1882-1960

On 27 June George Urdang, Consulting Editor to the Journal in the field of the history of pharmacy, died after an illness of eight years. He had retired from formal teaching in 1952; it is unfortunate that the professional activities which he would otherwise have continued even after that date were progressively curtailed by parkinsonism.

Professor Urdang was born at Tilsit, Germany, on 13 June 1882. Trained at the universities of Leipzig, Berlin, and Halle-Wittenberg, he combined experience in the practice of pharmacy and in the editing of the *Pharmazeutische Zeitung* with devotion to the history of his subject, and in 1926 he founded, with four friends, the German Society for the History of Pharmacy. His career in the United States, to which he transferred in 1938, was similar: he first obtained his pharmacist's license, then accepted the invitation of Edward Kremers to collaborate on the volume *History of Pharmacy* (1940), and in 1941 was influential in founding at Madison, Wisconsin, the American Institute of the History of Pharmacy, which he served as director until 1957. In 1947 the University of Wisconsin created

and accorded to him a chair in the history of pharmacy. His high standards of scholarship and his talents in the art of teaching won for him affectionate respect from students and colleagues alike, in all of whom he implanted a strong sense of their professional heritage. His contributions of books and articles to the literature were numerous. He was the recipient of many awards and medals and was a member—honorary, corresponding, or active—of many pharmaceutical organizations in various parts of the world. He served as Honorary Consultant to the Army Medical Library.

Something of his courage and philosophy of life may be comprehended from three sentences in a letter which he wrote on 27 November 1951, just 24 days after falling on an icy street and sustaining a triple fracture of the left arm immediately below the shoulder: "The worst lies behind me but I have still at least two cumbersome weeks before me. The lesson to learn from it? One shouldn't slip, in whatever respect."

Francesco Pellegrini, 1883-1960

With the death of Francesco Pellegrini on 30 March Italy lost one of her most distinguished medical historians, a man in whom knowledge of the past was combined with unselfish application to the demands of modern medicine, with love of country and people, and with all those qualities which, unchanged and unchanging today as in any earlier age, constitute the true gentleman.

Born in Verona in 1883, Count Pellegrini was graduated from the University of Padua in 1906 and initiated thereupon a career in military medicine and military hospitals which rendered signal service in the relief of suffering. At his death he was lieutenant general in the medical corps. He was also mayor of his town of Tregnago, near Verona, and member of Verona's Accademia di Agricoltura, Scienze e Lettere. His organizing capacities were nowhere more apparent than at the Sixth National Congress of the Società Italiana di Storia delle Scienze Mediche e Naturali, which was held in Verona 24-25 October 1953 in commemoration of the fourth centenary of the death of Girolamo Fracastoro. Unable to be present himself because of a heart condition, he sent as representative his devoted wife Enrichetta, daughter of the eminent mediaeval historian Count Carlo Cipolla. The proceedings of the congress, with Professor Pellegrini's official oration on Fracastoro which was delivered by the librarian of the great Biblioteca Capitolare of Verona, Mons. Giuseppe Turrini, were published in *Fracastoro. Studi e memorie nel IV centenario* (1954). After the congress some of the participants were privileged to enjoy the hospitality of Professor Pellegrini and his wife in their villa at Tregnago.

Professor Pellegrini's books, in which are contained both his researches in military medicine and his careful investigations of Renaissance manuscripts in the Biblioteca Capitolare, include *La medicina militare nel regno di Napoli dall'avvento dei normanni alla caduta degli aragonesi* [*1139-*

1503] (1932); *La clinica medica padovana attraverso i secoli* (1939); *La dottrina fracastoriana del contagium vivum* (1950); *Vita di Girolamo Fracastoro* (1952); Girolamo Fracastoro, *Carmina* (1954); and Girolamo Fracastoro, *Scritti inediti* (1955). His contributions to journals were many. He was generous in assisting the investigations of others, and he will be greatly missed in both Italy and this country.

Gregorio Marañón y Posadillo, 1887-1960

Born in Madrid, where his professional career was to be centered for the greater part of his life, Gregorio Marañón was without question the most distinguished and representative figure in Spanish medicine of the present century. In the Chair of Endocrinology at the Central University of Madrid he became well known for his studies on thyroid diseases (the Marañón sign is still used in the diagnosis of hyperthyroidism) and on the parathyroid and suprarenal glands. However, Marañón also influenced contemporary thought by his books, written for Spanish youth, on aspects of sex; the titles included *Amiel, Amor, Conveniencia y Eugenesia,* and *Don Juan.* Some of his biographical works, such as *Cajal, su tiempo y el nuestro, Antonio Perez,* and the *Ideas biológicas del P. Feijóo,* also had many readers.

The liberal attitude of Marañón during the Thirties, when he gave his name to the "Service of the Republic," brought a political bias to his professional life, and during the fratricidal Civil War in Spain (1936-1939) he lived in Paris.

Because of his high professional standing, his inspiring teaching in the University, the depth of his clinical knowledge, and most of all, the humanistic tradition which flowed through all his work, Spanish youth looked upon him for many years as one of its spiritual leaders in the intellectual awakening which was so much a part of the "Generation of '98," that philosophical group led by Ortega y Gasset, Giner de los Rios, and Unamuno among others.

To a certain extent, Marañón's return to Spain in 1939 after his self-imposed exile during the fratricidal war was a blow to the faith which so many of the younger generation had placed in him. Nevertheless, his Clinic of Endocrine Diseases, annexed to the Medical Faculty in Madrid, soon became the greatest of its kind in Spain, and the seminars, lectures, post-mortems, and clinical studies reached the very highest standards. Marañón's summer residence in Toledo, "El Cigarral," which was a true example of its owner's exquisite taste, also achieved world renown, and many medical historians made pilgrimages there. The house could be seen from the old Synagogue (now called Santa Maria la Blanca) and from the famous house of El Greco, the painter to whom Marañón devoted his best literary efforts.

It was in 1956, in his clinic at Madrid, that I last saw Marañón, and then, as ever, he demonstrated his outstanding conversational powers, being ready and willing to discuss anything that caught his interest, whether

celestial or terrestrial. We embarked on a discussion of the Moorish-Hebraic mediaeval translations of Toledo, went on to consider the work of Francisco Hernandez in sixteenth-century Mexico, argued about a case of Addison's disease which we had just seen in the wards, and ended up with a debate on bullfighting, comparing the art of Manolete with that of modern exponents.

Spain singled out D. Gregorio Marañón from among his peers, and in his lifetime he had the unique honor of being elected to the five Royal Academies, those of Medicine, the Sciences, History, Literature, and Art. He will be very much missed by all who counted themselves his friends, but perhaps the man who will mourn him most is his lifelong friend, Professor Teófilo Hernando. We would convey our deepest sympathy to the widow of D. Gregorio, to his son, and to his pupils all over the world.

F. GUERRA

Centenary of The National Hospital, London

On 19-24 June The National Hospital, Queen Square, celebrated the centenary of its founding, in the spring of 1860, by the efforts of two benevolent ladies who had witnessed in their own family the suffering which attends paralysis. Named originally "The National Hospital for the Paralysed and Epileptic," it opened its doors in a house at 24, Queen Square which was leased for £110 a year. Gradually it acquired additional property to enlarge its facilities for the care of chronic neurological patients. It now constitutes, with the Hospital for Epilepsy and Paralysis, Maida Vale, The National Hospitals for Nervous Diseases.

The anniversary features (Journal, 1960, *15*, 93) included a thanksgiving service, an opening ceremony performed by the Minister of Health, The Right Honourable Derek Walker-Smith, lectures on the history of the hospital and on neurology, a panel discussion under the chairmanship of Dr. Pearce Bailey on the future of neurology, the centennial oration by Dr. Macdonald Critchley, the Gowers Memorial Lecture by Sir Charles Symonds, and the Victor Horsley Lecture by Professor Norman Dott, clinical and scientific demonstrations and films, a reception given by the London County Council, a centenary subscription dinner and a centenary banquet, a sherry party at the Royal College of Physicians, a cocktail party at the Royal College of Surgeons, and a wine and cheese party by invitation of the Institute of Neurology. His Royal Highness The Duke of Edinburgh visited the hospital on 21 June.

A centenary exhibition arranged by Dr. William Gooddy, Dr. Richard A. Hunter, and Dr. J. Hamilton Paterson was on view in the Board Room. It was gathered from administrative and medical records of the hospital, from manuscripts and published works of its physicians and surgeons, the first of whom were Dr. Jabez Ramskill, Dr. Charles-Édouard Brown-Séquard, and Sir William Fergusson, and from notices in the periodical press.

Third Edition of The Croonian Lectures *of John Conolly*

Readers will recall the article by Richard A. Hunter and Ida Macalpine (Journal, 1959, *14*, 311-319) on John Conolly's anonymous publication on vaccination. It is pleasant to report now that a far more famous publication of his has been reprinted, as a contribution to World Mental Health Year, by St. Bernard's Hospital Management Committee, Southall, Middlesex. Conolly's great-granddaughter, Mrs. Dorothy Purves, assisted in the project, and it is entirely fitting that this memorial should have been issued by the very hospital, formerly called the Middlesex Lunatic Asylum at Hanwell, from which, within four months of his appointment there on 1 June 1839, Conolly abolished the instruments of mechanical restraint which had been used for refractory cases up to that time.

Conolly (1794-1866) delivered the Croonian Lectures *On Some of the Forms of Insanity* at the Royal College of Physicians in 1849. They appeared in *The Lancet* in October and November of that year and were republished by him in book form in the same year. Already in 1859 Dr. C. Lockhart Robertson complained in the *Journal of Mental Science* that the lectures, having been privately printed, were to be found only with great difficulty. They contain, he added, "in the most perfect English a long way the best description of the several forms of insanity in our language." The present edition is therefore eminently welcome, and its usefulness is increased by an informative preface on Conolly's career which has been provided by the Physician Superintendent of St. Bernard's Hospital, C. R. Birnie.

Second Pan-American Congress of the History of Medicine, June, 1961

Announcement has been made of the forthcoming Second Pan-American Congress of the History of Medicine, which will convene in Caracas, Venezuela, in June, 1961. The meetings will be held in conjunction with the First Venezuelan Congress of the History of Medicine and, sponsored by the Venezuelan government, will form one feature of the celebrations for the sesquicentennial of Venezuelan independence.

The President of the Organizing Committee is Dr. Franz Conde Jahn, the Secretary, Dr. José Maria Llopis, whose address is Palacio de las Academias, Caracas. The official theme of the congress will be "La Medicina Colonial en cada uno de los Países Americanos"; papers on this and on other subjects in the history of medicine should not exceed 20 typewritten pages and should be sent to the secretary by 31 March 1961. The exact dates of the congress will be determined later. Information concerning participation may be obtained from the secretary.

Bibliography of Laennec

For some ten years Mr. P. James Bishop, Librarian at the Institute of Diseases of the Chest, Brompton, London S.W. 3, has been compiling a

bibliography of items by and connected with the inventor of the stethoscope, the French internist Réné-Théophile-Hyacinthe Laennec (1781-1826). He is particularly anxious to learn of any manuscripts or letters which have remained either unpublished or unrecorded in the literature. His request in the *Times Literary Supplement* for 15 April 1960 elicited very few replies; anyone reading this notice and possessed of such information as he desires is earnestly invited to communicate with him.

New Chair of the History of Medicine and Science at Vancouver

The University of British Columbia at Vancouver, Canada, has announced the establishment of a Department of the History of Medicine and Science under the Chairmanship of Dr. William C. Gibson, Director of the Kinsmen Laboratory of Neurological Research. During the Spring Term of 1960 Dr. Gibson was Visiting Professor of the History of Medicine at Yale University. It is expected that the new Department in Vancouver will have very broad responsibilities throughout the University and in development of adequate collections in the history of all branches of science."

Tercentenary Celebrations of the Royal Society

The Royal Society of London, under the presidency of Sir Cyril Hinshelwood, O.M., celebrated its tercentenary 18-26 July 1960. Founded in 1660 "for the promoting of Experimental Philosophy," it is not the oldest of the scientific societies (the Accademia dei Lincei was founded in Rome in 1600), but it has had the longest history of continuous and distinguished existence. Granted a royal charter by Charles II in 1662, it enjoys to-day the patronage of Elizabeth II who formally opened the session on 19 July in the Royal Albert Hall.

The impressive program included formal scientific sessions as well as pilgrimages to places and institutions that have played important parts in the life of the Society—Greenwich, Oxford, Cambridge, and numerous institutions in and about London.

The Times issued a special number of xxiv pages on 19 July, and Mollie Panter-Downes' "Letter from London" to the *New Yorker* on 27 July was devoted entirely to the tercentenary celebrations and, as is usual with her reports, was not only factual but lighthearted and entertaining. These of course were but two of many tributes.

By far the most important printed document issued for the occasion was *The Royal Society: Its Origins and Founders* (published as a separate and also as Vol. XV of *Notes and Records of the Royal Society*), edited by Sir Harold Hartley and containing biographies of 21 of the founder members (including a sketch of Charles II, "Fundator et Patronus," and two accounts of Christopher Wren, that many-sided genius who would have been a far more famous scientist than he was had not the rebuilding of London after the Great Fire absorbed the greater part of his energies). Dr. Douglas

McKie's paper on "The origins and foundation of the Royal Society of London" is a welcome summary of the early meetings out of which gradually evolved "The Royal Society of London for Improving Natural Knowledge." Warm congratulations are due Sir Harold for the masterly fashion in which he marshalled his many authors into line and succeeded in keeping them to a time schedule, but more particularly for the splendid manner in which he exercised his editorial pencil to avoid contradictions, repetitions, and other pitfalls to which a multi-authored volume is such easy prey.

The *Brief History of the Royal Society* by E. N. daC. Andrade (28 pp., 14 illus.) is also a most attractive booklet containing excellent photographs, among others, of the first and current Presidents. The appearance in July of the second handsome volume of *The Correspondence of Isaac Newton,* edited by H. W. Turnbull and published for the Royal Society by the Cambridge University Press, stands as another enduring monument both to the Society and to one of its most distinguished Fellows.

First George Sarton Memorial Lecture

The first George Sarton Memorial Lecture is to be given by Dr. René Dubos of the Rockefeller Institute on Tuesday, 27 December 1960, at 8 p.m. in the Baroque Room of the Belmont-Plaza Hotel, Lexington Avenue and 49th Street, New York, following the annual dinner of the History of Science Society. The Lecture is open to all interested people.

Book Reviews

Henry E. Sigerist on the History of Medicine. Edited with an Introduction by Felix Martí-Ibáñez. Foreword by John F. Fulton. New York, MD Publications, Inc., 1960, xviii, 303 pp., $6.75.

Reviewed by RICHARD H. SHRYOCK, *Librarian, American Philosophical Society, Philadelphia, Pennsylvania.*

IT was a happy thought to bring together this collection of Henry Sigerist's papers on the history of medicine. Those already familiar with the essays will enjoy refreshing their memories and, what is more, will gain a cumulative impression which is best derived from consecutive reading. And those who have not known Sigerist's writings will find here an introduction to a great medical historian and to much that was significant in his work.

One is tempted, after going through these materials, to appraise once more their author's qualities as a historian. There is so much to admire—the range of his interests, the breadth of his perspective, the seeming ease with which he dissects out significant developments in any given theme. There is also the rare combination of social with scientific interests, the ability to bring the past to bear upon the present, and the flair for investing scholarship with warm, human interest—all expressed in an English style which I think (despite his disclaimer) was just as effective as was his earlier German prose. But since Dr. Fulton and Dr. Martí-Ibáñez make discerning observations on these matters, I will limit my comments chiefly to the collection as such.

The present volume contains 27 papers in all, arranged under four headings: medical history, ancient and medieval medicine, medicine between about 1500 and 1800, and "personal history." The second and third topics are self-explanatory. To the first are assigned essays which have no sharp time limits, except in the case of one on American spas. The final category contains papers which emphasize the author's tastes and viewpoints, as well as those which are frankly autobiographical in nature. Just because Sigerist expressed his own personality in much that he wrote, this last section is of unusual interest, though it is here that some readers may disagree if they do not happen to share his taste for "American truffles" or his opinions on more weighty matters.

If the papers had been presented in the order of publication, the sequence might have given hints about the evolution of their author's thought. At the same time, such an arrangement might have been confusing to readers. The editor states that the selections were made by Dr. Sigerist himself—a fact which adds to their significance but also poses questions. With two or three exceptions, all those presented were published in Eng-

lish after Sigerist came to the United States; that is, after he was about forty years of age. Why his earlier papers were omitted is not clear, though he may have assumed that he was selecting for an American audience. In any case, the omission leaves a gap in the collection.

It must also be remembered that some of Sigerist's most significant writing appeared in his books. Few if any of his essays can offer the extraordinary sweep and synthesis which are combined, for example, in *The Great Doctors.* Yet within this necessary limitation, and also within that implied by the omission of the earlier papers, the present collection is effective and illuminating.

Henry E. Sigerist on the Sociology of Medicine. Edited by Milton I. Roemer. Foreword by James M. Mackintosh. New York, MD Publications, Inc., 1960. xiii, 397 pp. $6.75.

Reviewed by GEORGE ROSEN, *Professor and Head of the Division of Public Health Education, Faculty of Medicine, Columbia University, New York City.*

SIGERIST thought of himself as more than just an historian. On various occasions he referred to himself also as a medical sociologist. Furthermore, he not only set as his life's goal a monumental history *and* sociology of medicine, but even the most superficial review of his published writings clearly shows that for him the sociology of medicine was an integral part of his work as an investigator, teacher, and writer. Recognition of the importance of his work in medical sociology has lagged behind the acceptance of his achievement as a historian. This has been due in part to the circumstance that Sigerist's contributions to the sociology of medicine are scattered through a series of books and articles spread over a period of more than 30 years. This difficulty has now been dispelled in considerable measure by the publication of the volume reviewed here and of its companion containing essays on the history of medicine.

According to Dr. Roemer, the editor of this volume: "The objective was to make available the principal Sigerist papers on medical sociology not to be found elsewhere in book form." Thirty-one papers were selected. They range in time from 1931 to 1955. Some derive from Sigerist's Leipzig period; most, however, originated during the 15 years when he headed the Institute in Baltimore. The range in content is likewise broad. There are papers on countries with which he was actively involved: Yugoslavia, the Soviet Union, Canada (Saskatchewan), India, and South Africa; and on topics of special interest: the physician and his environment, the social position of the patient, medical economics, social security, group health plans, spas, medical licensure, the hospital, dentistry, medical education. The wealth of thought and expression contained in this collection can certainly not be listed in full. For each paper the editor has indicated briefly the circumstances under which it was written and where it was first published.

In terms of selection and editorial preparation, Henry Sigerist has been well served in this volume. This is not as true, however, of the interpretation of the content. Dr. Roemer has interpreted Sigerist's work in medical sociology much too narrowly, and his endeavor to draw some sort of distinction between medical history and medical sociology is at best ingenuous. The fact is that this cannot be done in any meaningful way, and therefore should not be done. Sigerist conceived the sociology of medicine as comprising both historical and contemporary dimensions. The question really is: What did Sigerist mean by medical sociology?

As one studies his work, it is evident that Sigerist was concerned with setting out panoramically the development of health services in society, with understanding the phases or stages through which this evolution has passed, and with elucidating the factors and processes involved. In his mind's eye he saw this panorama of development from the earliest periods of human life through the present into the future. Within this frame of reference, Sigerist conceived the sociology of medicine as the study of the political, economic, and social structure of past and present societies and the determination of the place and function of health services in these societies.

This concept may be elaborated as follows. Man lives as a member of a group, and by acting in relation to and with his fellowmen, social systems are created. These are linked to varying modes of life and various institutions. In living together, men experience problems relating to health and disease which affect the individual and the group. All societies have some kind of social organization to deal with such matters. The nature of this organization, how it functions, what leads to changes in it—these are questions that must be studied in terms of various factors, some scientific, others deriving from other areas of community life. Political changes, social class relationships, religious beliefs, psychological attitudes—one or all of these may have to be studied to understand the patterns characteristic of various civilizations or societies in history as well as the changes they experienced in time. Within this approach, the historical method of study can explain and illuminate why change occurred in the past, and perhaps assist us in understanding why change occurs in the present, thus helping us to move toward the future.

Throughout his career, Sigerist was moving toward an historical sociology of medicine. He saw historico-sociological analysis as an instrument to be employed for the benefit of people. While he never achieved his goal in full, the vision of Henry Sigerist can be shared by the reader of this volume. One can only welcome the appearance of this book and recommend it to all. It is an excellent example of book making and has a useful index. It is a book to be read by anyone concerned with the health and welfare of human beings.

WILLIAM LEFANU. *A Catalogue of the Portraits and other Paintings, Drawings and Sculpture in the Royal College of Surgeons of England.* Edinburgh and London, E. & S. Livingstone Ltd., 1960. (The Williams & Wilkins Co., Baltimore, exclusive U. S. agents). xii, 119 pp., illus. $6.75.

Reviewed by C. DONALD O'MALLEY, *Professor of Medical History, University of California at Los Angeles.*

ALTHOUGH there have been previous catalogues of the portrait paintings and busts in the Royal College of Surgeons of England, such catalogues were only partial listings of the holdings of the College and have been rendered further obsolete by reason of significant additions to those holdings in recent years. Now, for the first time, this notable collection of paintings and sculpture, as well as the collection of views of the College and various topographical drawings and ornamental sculptures, have been fully catalogued.

The catalogue has been arranged in two parts. The first part describes the portraits in alphabetical order, and the second describes paintings other than portraits, such as the notable animal studies of George Stubbs, followed by a description of drawings. The descriptions are full, providing dimensions, subject of painting or drawing, provenance and any previous literature about or reproduction of the particular work. Whenever available, information regarding incidents relating to the course of composition, cleaning and restoring, and the like is provided, so that a commendable thoroughness has been achieved in the descriptions.

Many of the readers of this journal must at one time or another have had the pleasure of seeing the College's impressive portrait collection of which, for example, the portrait of William Cheselden and the Reynolds portrait of John Hunter always make a lasting impression upon the viewers. It is pleasant therefore to have full, authoritative statements regarding these and other portraits and drawings, and especially to have a clear statement regarding the painting of "King Henry VIII with the Barber Surgeons." Over a period of time a considerable body of misinformation has come to surround this particular painting and has made difficult any proper understanding of its origin; now in this particular instance Mr. LeFanu has performed a distinct service in separating fact from fancy. Indeed, the author of the catalogue deserves considerable praise for making available what should for long remain the standard authority on the College's collection of portraits and other artistic works.

The catalogue is completed by two indices, one of artists and the other of subjects, followed by a selection of portraits and drawings reproduced in black and white. Unhappily, however, the several portraits reproduced in color are rather lacking in excellence and considerably below the quality of the text. Despite this flaw, any visitor to England who intends to visit the College and view its collection of artistic works would find such a visit made even more enjoyable after a study of Mr. LeFanu's catalogue.

KATE TRAUMAN STEINITZ. *Leonardo da Vinci's Trattato della Pittura.* Copenhagen, Munksgaard, 1958. 244 pp.

Reviewed by KENNETH D. KEELE, F.R.C.P., *Consultant Physician to the Ashford and Staines Hospitals, Middlesex, England.*

THIS fascinating bibliographical study must be unique in many ways. First of all in its subject matter, for Leonardo's "Treatise on Painting" is itself a Treatise in spirit only, since he never wrote it as such. Yet what a vital "ghost" it is, the spirit of which has vitalised the life of so many generations of artists and art lovers down the centuries to the present day.

Many have attempted to trace Leonardo's influence, so elusive and yet so powerful, through the development of European art and science, but none has done it in the form of a bibliographical study of the one work attributed to him. This Kate Steinitz has achieved. At first, not being bibliographically trained, this reviewer approached the book with some trepidation, anticipating massive erudition and a wilderness of catalogued minutiae. This would have left justifiable comment only to those appreciative of bibliographical methods and results; but merely opening the book and reading the foreword by Dr. Elmer Belt and the introduction revealed that here was a deeper study; here was an account in its most authentic form of the struggles of Leonardo's thought to find expression and communication to other men. The work behind this study is massive, the erudition upon which it is based is immense, but on almost every page this toil and erudition are infused with an ardent enthusiasm which flickers from book to book, and from person to person, each a link in the chain of communication of Leonardo's wisdom.

Francesco Melzi, Leonardo's favourite pupil, has been submitted to sharp criticism for producing so little of Leonardo's notes in those 49 years of his life in which these manuscripts remained in his care, after Leonardo's death. Perhaps this criticism should be mellowed by the realization that his effort to achieve publication of his master's thought on the one subject of painting in which Melzi himself was proficient ended incompleted. After all, Melzi only shared the inadequacy of his contemporaries in finding Leonardo's mind overwhelming. If he was overwhelmed by Leonardo's Treatise on Painting, how much more was this to be expected with regard to Leonardo's scientific studies, from mechanics to anatomy? Even in the compilation of those notes which eventually emerged in the *Codex Vaticanus* (Urbinas) 1270, Melzi had to call in the aid of others to search through the thousands of pages of Leonardo's notes. As Steinitz mentions, "The transcriber had to decipher Leonardo's left-handed mirror-writing and to interpret his wayward abbreviations and spellings." Apparently Melzi had no access to that lost Treatise of Painting completed by Leonardo himself which is mentioned by Luca Pacioli in 1498.

A feature of great interest emerging from the study of the manuscript copies of the Treatise on Painting is the fact that, although famous and ap-

preciated, it was for so long not printed. Apart from extracts appearing in Lomazzo's *Trattato dell Arte della Pittura* in 1584, none was printed before the Italian and French abbreviated edition in 1651, a delay of over 150 years. Why? Was it because Leonardo's precepts were too revolutionary? Or was it because, as Steinitz suggests, Vasari had reported him as being of "so heretical a cast of mind that he conformed with no religion whatever, accounting it, perchance, much better to be a philosopher than a Christian?" Whatever the answer, the salient fact remains that around Leonardo's works, known or unknown, there accumulated a conspiracy of silence. During this silent gap 23 manuscripts of the Treatise on Painting, based on Melzi's compilation, appeared. It is significant that they were all "abbreviated" by the omission of Leonardo's theoretical discussion of painting and the other arts, presumably because this involved the subjects of optics, anatomy, etc., too scientific for contemporary minds.

Even in the first half of the 17th century, when interest in science was developing, seven more manuscripts appeared before finally the Treatise burst into print—in its abbreviated form. This achievement redounds to the credit of Cardinal Barberini's friend and secretary in Rome, Cassiano dal Pozzo. It was through him that Nicolas Poussin became acquainted with Leonardo's works; and Cassiano dal Pozzo finally enlisted Poussin's aid in drawing the diagrams for the first edition of the Treatise on Painting in 1651. Cassiano dal Pozzo's collection of Leonardo manuscripts revealed to him the value of their scientific aspects. These he explored in a series of manuscripts containing chapters on optics, physics, mechanics, hydraulics, and the natural sciences. Anatomy was not included amongst them since, as Cassiano dal Pozzo writes: "Of the requested figures which are not sent some pertain to the treatise of the anatomy of the natural things, and others to the treatise on colour, which treatises are in the hands of the King of England." This note, written between 1634 and 1640, dates the acquisition of the anatomical manuscripts; mention of which was next to appear, surprisingly enough, in an inventory of the prints and drawings, about 1735 in "the Buroe of His Majesty's Great Closet at Kensington," England.

Manuscripts made about 1637 by Cassiano dal Pozzo for Cardinal Barberini, through the conquest of Napoleon, reached the hands of G. B. Venturi in Paris, forming the material from which he presented the first account of Leonardo's scientific work to the world in his *Essay sur les ouvrages physico-mathematiques de Leonardo de Vinci* (1797), and a lecture on optics in 1815.

The curious subterranean spread of Leonardo's knowledge has always been one of the fascinating mysteries of its fate; the story of these manuscripts tells how the roots spread into many European countries, and how they eventually broke surface in 1651. From this date there has been a steady flowering of Leonardo's published work, as represented by the Treat-

ise on Painting. Five editions during the 17th century have grown to 25 so far during the 20th, and of course many publications on various aspects of Leonardo's work have appeared from the pens of those with special knowledge, since only they, even now, are competent to deal with the penetration of Leonardo's thought into any individual subject that claimed his attention.

This bibliography thus bears a unique burden, and that most worthily, for it covers the deep roots of the sources into which all students of Leonardo must delve. The gathering of these manuscripts and printed editions into one place in the Elmer Belt Library of Vinciana in Los Angeles is itself an achievement of the greatest importance to students of Leonardo; and the presentation of these works in so well arranged a series, with such full bibliographical detail provides an excellent example of the use of the finest collection of Vinciana yet to be made. Dr. Elmer Belt tells us that "They are variegated, odd-looking volumes, sixty-two of them, augmented by five manuscripts. Some are prim, tidy and precise, others scrawled, hasty and incomplete. . .and they occupy one small shelf of books in our library." Such modest reference to the material on which this bibliography is based only serves to emphasize the richness of the mine of Leonardo treasure contained in that Library; and this book is an earnest of how skillfully that mine is being worked.

WILLIAM GILBERT, *De magnete.* Translated by P. Fleury Mottelay. New York, Dover Publications, Inc., 1958. 57, 368 pp. $2.00.

WILLIAM GILBERT, *On the Magnet.* Introduction by Derek J. de Solla Price. New York, Basic Books, Inc., 1958. 12, 16, 246, 6, 68 pp., $8.50.

Reviewed by BERN DIBNER, *Director, Burndy Library, Norwalk, Connecticut.*

THE first is an unabridged and unaltered re-publication of the first translation into English of this classic of science that appeared in New York in 1893. It joins other important works in science which the publishers have made available at low cost to students.

Nearly three centuries elapsed before Gilbert's important contribution in experimental science appeared in his native English; the original *De magnete* was published in London in 1600 in Latin. Thus, two and one-half centuries separated the third Latin edition (1633) and this first translation into a modern tongue. The popularity of the subject is reflected in the two recent additional appearances of *De magnete.* The first was the 1958 facsimile reproduction of the rival English translation prepared by the Gilbert Club of London as a tercentenary commemorative volume in 1900. The second was Duane H. D. Roller's *The De Magnete of William Gilbert,* published in Amsterdam last year. Both were more expensive than the Dover edition. William Gilbert (1544-1603) was an eminent physician

who rose to the top of his profession. He became President of the Royal College of Physicians in London and also one of the staff physicians to Queen Elizabeth. For a few months before his death he served James I. He was admitted to practice on 13 May 1569, after graduation from St. John's College, Cambridge. In the Royal College of Physicians, he became Censor in 1581, then rose to the office of Treasurer, Consiliarius and finally President in 1600, the year of the publication of his great work.

In spite of the demands made on his time as physician, Gilbert delved deeply into the behavior of the magnet. The foundation of his attack on magnetic behavior was *experiment.* He brushed aside dependence on the authority of earlier writers and carefully performed and repeated experiments with lodestones, iron, armatures and shields, magnetic compass and dipping needle, and with navigational instruments. He determined and catalogued magnetic and non-magnetic materials. The five forms of magnetic motion became the titles of five of the six "books" that constituted his thesis. In order to compare magnetic attraction and the attraction of amber to certain light bodies he digressed into an elaborate series of experiments and thereby laid the foundation of electrostatics and electrical science. (The international unit of magnetomotive force is termed the "gilbert.") Similarly, he determined the magnetic properties of spherical lodestones and concluded that the earth also was a great magnet. This dependence on experimental corroboration establishes him as the most important of the experimentalists of the late 1500's, one who helped open the door into the fruitful 1600's.

Gilbert willed his books, manuscripts, globes, instruments, and minerals to the Royal College of Physicians to form part of its library, a building near his London home. This went up in flames in the Great Fire of London in 1666, leaving little for future historians from which to reconstruct his life and gifts. Since the appearance of Mottelay's translation of *De Magnete,* much new material has been uncovered by S. P. Thompson and the Gilbert Club. That is why Mottelay's biography and bibliography are to be treated only historically. Gilbert was born in 1544, not 1540, as there indicated, for instance. Roller in the most recent appraisal of Gilbert corrects the translation and fills in omissions in the Mottelay text. However, the world of scholarship and science is thankful to the author for this first effort at translation and to the publisher for making this important text available at low cost.

The second classic in the Collector's Series in Science was re-issued as the handsome Gilbert Club edition in facsimile with eight pages of introduction by Derek Price, then at the Institute for Advanced Study. Originally a labor of keen admiration by a British group headed by Lord Kelvin, the edition of only 250 copies on large paper was designed to reproduce the flavor of the 1600 edition and to follow format, collation, and appearance in every way, only substituting English for the original Latin. An

index was added and a supplementary set of notes was prepared and issued in 1901; both appear in the facsimile edition. Modern reproduction methods have thus made the rare and coveted Gilbert Club issue available in a pleasant form for the price of an average textbook. Any inaccuracy of translation that may have crept in as a result of so faithfully imitating the appearance of the Latin book was recently corrected by Roller's definitive study and criticism of both the Mottelay and Gilbert Club editions. Three editions appeared in the first 33 years of the life of the book, but eight more have been issued in the last 66 years—evidence enough of the vitality of its message.

CLAUDE BERNARD. *An Introduction to the Study of Experimental Medicine. Translated by Henry Copley Greene. With an Introduction by Laurence J. Henderson. With a New Foreword by I. Bernard Cohen.* New York, Dover Publications, Inc., 1957. xix, 226 pp. $1.50.

CHARLES SINGER. *A Short History of Anatomy and Physiology from the Greeks to Harvey.* New York, Dover Publications, Inc., 1957. 270 illus. xii, 209 pp. $1.75.

CHARLES SINGER. *From Magic to Science. Essays on the Scientific Twilight.* New York, Dover Publications, Inc., 1959, 158 illus. xxxi, 253 pp., $2.00.

Reviewed by THOMAS R. FORBES, *Acting Editor.*

THE first English translation of Claude Bernard's *Experimental Medicine* appeared in 1927, while the above-mentioned books of Charles Singer were originally published in 1925 and 1928. Readers will be glad to know that all three are available in paperback editions. The *Anatomy and Physiology,* originally entitled *The Evolution of Anatomy,* has been revised. Paper, printing, and binding of all three books are of good quality. It is hoped that the reprinting in inexpensive form of classics in the history of medicine will be continued.

WILLIAM CARLETON GIBSON. *Young Endeavour. Contributions to Science by Medical Students of the Past Four Centuries.* Foreword by Sir Henry Dale, O. M. Springfield, Ill., Charles C Thomas, 1959. xx, 292 pp., illus. $6.50.

Reviewed by F. GUERRA, *Research Associate, Yale University School of Medicine.*

THE achievements of youth in medical history could not have a better chronicler than Gibson; with unique spontaneity and a complete understanding of the enthusiasm of youth, the author brings life to the characters he studies. More than one hundred scientists who made major discoveries during their undergraduate years are grouped under headings such as Anaesthesia, Anatomy, Bibliography, Cardiovascular system, Chemistry, Di-

gestion, Endocrines, Pathology, Lymphatics, Nervous System, Physics, and Optics. By means of this arrangement, the author has been able to traverse every field of medicine and to bring forward his characters in a carefully balanced presentation of periods and countries, thus providing an integrated picture which is seldom found in works by other authors. As a result of this pattern, Vesalius appears near Ramón y Cajal, Steno is with Cannon, Jenner with Virchow, Sherrington with Cotugno, and Galileo with Helmholtz. The biographical material is clear, elegant, and well illustrated; it comes to the reader with such force and stimulating impact that no better collection of biographies could be offered to the medical student as a source of inspiration for his career.

However, the index is perhaps somewhat misleading, as only Billings appears listed under the chapter on bibliography, although Gesner and Haller, his predecessors, have not been ignored, and their lives and contributions are properly considered. Some select illustrations, consisting of portraits, cuts, and title-pages, are included, together with quotations reflecting important moments and ideas, taken from various authors. Gibson's book is a must for medical undergraduates, that they may realise the importance of discoveries made by others even before they were of age.

EDWARD H. RICHARDSON. *A Doctor Remembers.* New York, Vantage Press, 1959. 252 pp. $3.95.

Reviewed by HERBERT THOMS, *Professor Emeritus of Obstetrics and Gynecology, Yale University School of Medicine.*

THIS book by a former student and faculty member of the Johns Hopkins University Medical School is significant as a penetrating and juridical account of early and later years of this great medical institution. It is also the life experience of one of the distinguished leaders in American gynecology. Medical historians will welcome it as source material because of the author's intimate association with the Big Four, Welch, Osler, Halsted, and Kelly. His contact with the last named as student, house officer, teaching associate, and friend places him in a unique position to evaluate Howard A. Kelly who was acknowledged as the greatest gynecologist of his time.

Dr. Richardson has no need to deplore his lack of skill in writing as he does in the introduction. His unaffected and straightforward narration is good writing, characteristic of the direct approach which he probably carried to the operating table. He does not need to be modest about it.

Of importance to those interested in medical education are the author's comments on the so-called system of full-time medical teaching. His criticisms, sharpened by 43 years of observation, are for the most part highly constructive. This is a many-sided subject, a good many sides of which are well known to this reviewer whose own experience with private practice and full-time teaching has been extensive. All educational "systems" have

built-in defects, but in Richardson's words, "Discussion clarifies everything it touches." Many of his arguments have essential soundness, and the contest is by no means over.

An engaging portion of the book is the author's account of his boyhood and school days in rural Virginia. These years and the later ones in the Susie Slagle era at the Hopkins Medical School have a human interest which will be especially cherished by readers at all familiar with that exciting period in Baltimore. Later chapters tell of the author's life as a successful gynecologist and innovator of surgical procedures. Throughout the book there is an anecdotal richness which adds a pleasing touch and also tells us much about Edward H. Richardson, raconteur and dedicated man of medicine.

HERBERT LAMONT PUGH. *Navy Surgeon.* Philadelphia, J. B. Lippincott Company, 1959. 459 pp. $5.00.

Reviewed by FRANK B. ROGERS, *Director, National Library of Medicine, Washington, D. C.*

THIS book is described on the dust-jacket as the autobiography of the man who at the time of the Korean conflict was Surgeon General of the U. S. Navy. The first section, under the heading "Green Years," begins with a geographical and genealogical account and ends with Admiral Pugh's graduation from the University of Virginia, internship, and entry into the Navy. The remaining two sections, under the headings "Heyday" and "Vintage Years," read almost as if they were transcribed with only minor changes from a prudently kept journal, in which the strictly chronological entries are of the type which mentions places and persons as jogs to the remembrance of ideas and issues and feelings, a transition seldom made in the instance at hand.

The book is full of anecdotal episodes: dogs named Rover who catch squirrels in mid-air and are master snake-killers; a colored family retainer well versed in botanical lore; the uncanny accuracy with which backwoods schoolboys throw balls made of string and yarn; the excitement of hog-killing day in rural Virginia at the turn of the century. It is full of cracker-barrel speculations on the Chinese question, the Japanese question, and the question of the survival of religion in Russia. It is sprinkled with gratuitous facts: a thumbnail biography of General Claudius Crozet, who in 1832 gave up his position as State Engineer for Virginia, went to Louisiana, and then returned to Virginia seven years later; the full text of an inscription on a Confederate monument in Columbia, South Carolina; the chronology of the Czars; the length of the Simplon tunnel. It is very full indeed of precise travel itineraries: the exact minute at which planes took off for Newfoundland, Khartoum, or Point Barrow; the number of miles flown on each leg of each trip, the number of take-offs, the number of landings, and the

tidy sum of all the miles on all the legs; the unvarying route followed, street by street, in driving between home in Drexel Hill and the Philadelphia Naval Hospital; and the name of the ship on which the Admiral's ancient Ford was shipped from Panama to Norfolk. It is scattered here and there with medical items, and these ordinarily take the form of names of installations visited and "interesting" cases seen: the officer who drank too much and smashed up his automobile; the radioed obstetrical instructions; the patient with a radical bowel resection who is today a veritable picture of health; and the Chamorro whose femoral artery was severed by the razor-keen gaff of a fighting rooster. It is, in short, a potpourri of oddments which from time to time command a wry interest; it is a homely account of the sights and scenes of one officer's life, but it is not an abundant sourcebook for students of military medicine.

It must be noted, finally, that the copyreading has been atrocious. Initial dependent clauses are followed by semicolons; qualifying phrases are preceded but rarely followed by a comma. Proper names are misspelled, or spelled in variant forms on second mention. The instances of such barbarous usage are many, and quite distracting.

Grosse Nervenärzte. Band II: 22 Lebensbilder, Herausgegeben von Prof. Dr. K. Kolle, Stuttgart, Georg Thieme Verlag, 1959. x, 252 pp., 21 illus. DM 29.40 ($7.00).

Reviewed by GEORGE ROSEN, *Professor and Head of the Division of Public Health Education, Faculty of Medicine, Columbia University, New York City.*

IN 1956, Professor Kolle edited a volume of biographical essays dealing with outstanding psychiatrists and neurologists. The volume reviewed here is a sequel, containing 22 similar essays. Geographically, the majority of the subjects represent the German language area (Germany, Austria, Switzerland). There are two Americans, two Britons, one Swiss, one Italian, and four Frenchmen. The time span covers chiefly the late 19th century and the first half of the 20th century. Only Esquirol represents an earlier period.

The biographies are no longer arranged alphabetically but are grouped into four sections: basic investigators (Golgi, Nisse, Alzheimer, Brodmann, C. and O. Vogt); inventors (Helmholtz, Quincke); clinicians-psychiatrists (Esquirol, Meynert, Wernicke, Adolf Meyer, Gaupp); neurologists (P. Marie, Babinski, Head, von Economo); therapist-surgeons (Horsley, Dandy, Vincent); and psychotherapists (Dubois, Simon). In addition to the biographies, there is a chapter by Erwin Ackerknecht on the history of psychiatric and neurological teaching and research institutions in France, Great Britain, Italy, Russia, Switzerland, Belgium, Holland, and the Scandinavian countries. As one might expect in a volume with 20 contributors, the in-

dividual essays vary in quality. Among those of greatest interest to me were the biographies of Franz Nisse, Alois Alzheimer, Carl Wernicke, and Robert Gaupp.

The title of this book is clarified by the subjects of the biographies. It is obvious that at the beginning of this century brain pathology occupied a central position of interest in psychiatry. Meynert, Wernicke, Alzheimer, Flechsig, Westphal, and Ford were all professors of psychiatry as well as neuroanatomists or neuropathologists. In many countries, the link between psychiatry and the study of the nervous system was broken; in Germany, however, this was not the case, or at least not in the same degree. In German the term *Nervenarzt* can still be used to cover the psychiatrist and the neurologist.

The two volumes edited by Kolle are useful, even though they do not achieve what Kirchoff's *Deutsche Irrenärzte* did. These volumes should be readily accessible to anyone interested in today's psychiatry and neurology.

HERBERT JOSEPH SPINDEN. *Maya Art and Civilization.* Indian Hills, Colorado, The Falcon's Wing Press, 1957. xliii, 432 pp., 30 + lxvii pl., 286 + 86 text figs. $10.00.

Reviewed by F. GUERRA, *Research Associate, Yale University School of Medicine.*

Two independent monographs appear under this title: one of them concerns Mayan art, and the other deals with the relations of Mayan culture to that of other Nuclear American civilizations. It should be remembered that the correlation of Mayan art and Mayan dates was in great part evolved by Spinden in the years 1906-1909, while he was exploring the ancient ruins in Honduras, Guatemala, and Mexico. His findings were one of the great strides forward in solving the vexed question of Mayan chronological sequences and the idea of time which they conveyed. Now, almost fifty years later, Spinden's thesis, developed at Harvard's Peabody Museum, could be reprinted with very little alteration, and in many respects his doctrine still stands unchallenged. Spinden's system of dating put back all the Mayan dates by 260 years; now the dates obtained by applying the Carbon 14 method to the two beams of the Tikal temple, as well as other vegetable and animal material, seem to confirm Spinden's system. On the other hand, different readings can vary by as much as seven hundred years.

The chronology of the Mayan inscriptions, and the manner in which Spinden solved the problem of the tropical solar year and the Venus year of the Maya, together with other of their concepts of time, are always of extreme interest to the student of the Maya. However, it is not always clear through the text which of the contributions in this book were actually developed by Spinden himself, and which should be attributed to Förstemann, Goodman, or Maler. The numerous beautiful illustrations which

accompany the context enable the reader to follow the characteristics of the architecture and minor arts of this culture, and the forms that were most usually represented, both human and serpentine. Other subjects such as the jaguar, birds, divinities, and astronomical signs are also studied, though with less emphasis.

The second part of the book is devoted to a comparative study of the Mayan civilization and its relations with those of the Olmec, Zapotec, and Aztec; here the contribution is less original and reveals a weak point in that the reference literature published during the past fifty years is missing. Although our knowledge of the Maya is still very incomplete, and there are as yet many points which remain to be solved, recent contributions have evolved in a different direction to those which were put forward at the turn of the century. There is, of course, no mention of the new findings at Dzibilchaltun—which is, freely translated from the Maya, "the place of the written stones"—an archaeological discovery which is likely to have untold importance in the search for knowledge of the Maya.

The major contribution in Spinden's work is contained in his ability to grasp the Mayan dynamic dating, combining a highly accurate astronomical knowledge with a poetic sense of life. In this respect, Spinden's book has probably no equal for detail and accuracy.

SAMUEL FASTLICHT. *Bibliografía Odontológica Mexicana.* México, La Médica Mexicana, 1954. 220 [4] pp. 36 illus.

Reviewed by F. GUERRA, *Research Associate, Yale University School of Medicine.*

DR. Fastlicht's book reaches this Journal after considerable interval; however, its review now is justified in view of the scarcity of bibliographical studies on dentistry in Hispanic-America. In 1910 Patiño issued a few pages on dental publications in Colombia, in 1918 Sundt did the same for the Chilean publications, but by far the largest and most important work in this field—that by Weber on Cuba—remains unpublished. Although of European origin, Dr. Fastlicht studied dentistry and practised orthodontics in Mexico City. For many years he has been patiently gathering together not only medical publications, but also archaeological material which he has made public in scholarly works on pre-Columbian dentistry and dental mutilations among the Mexicans. Some of us followed and shared with him this interest, but, as Dr. Fastlicht points out in the preface to his work, one in particular of all his friends was a continual source of guidance and generous help, Mr. Salo Hale, an erudite collector whose name can be mentioned in the same breath as those of Lenox or Phillips: he has played the rôle of Maecenas for many a Mexican historian and bibliographer, including this reviewer. Through years of close friendship Mr. Hale was the soundest guide to Fastlicht's archaeological and bibliographical development; the

wealth of his library, the unique value of many of his archaeological pieces, and above all his refined knowledge and most rare sense in collecting have always been graciously offered to the students of Old México.

This Mexican Dental Bibliography offers the material appearing in Mexico from 1552 to 1950 either in manuscript or printed form. The study also covers lists of theses presented for graduation at the dental schools of Mexico City since 1907, and other Mexican cities such as Guadalajara, Mérida, Puebla, and Monterrey, which also had dental schools of later date. A total of 1,635 dental entries are included. An important section of this work is devoted to the study of 32 periodicals on dentistry which were published in Mexico from the 19th century.

The work is accurate, balanced, and exhaustive and very little could be added except perhaps for more critical analysis of the early medical publications, of which, in some cases, no other copies have appeared in the last quarter of century. Some samples of dental hagiology, with prayers to Saint Apolony, are included. In his work Dr. Fastlicht reflects the influence of another contemporary dental historian, B. W. Weinberger, whose books on bibliography and history of dentistry are permanent tools for the scholar. To Dr. Fastlicht must go the gratitude of medical and dental historians, but more particularly that of the dental profession of Mexico, for the way in which he has been able to preserve for the years to come the scientific contributions of Mexico in a field which has been until now entirely neglected.

VIRGINIA CAMERON and ESMOND R. LONG. *Tuberculosis Medical Research. National Tuberculosis Association 1904-1955.* New York, National Tuberculosis Association, 1959. Historical Series No. 9, 325 pp. $5.00.

Reviewed by JOHN R. PAUL, *Professor of Preventive Medicine, Yale University School of Medicine, New Haven, Connecticut.*

IN this volume one finds the early story of the development of this nation's program for carrying out research in the field of tuberculosis. One also finds how this proved to be a pilot endeavor which led in later years to the development of many similar movements in clinical research.

Although the origins of the tuberculosis research program date back to 1904, its real beginning took shape shortly after World War I, when leaders in the voluntary health movement accepted the view that research was a proper function of a voluntary body of this type. Previously and naturally enough, in raising money "for tuberculosis," emphasis had been placed upon the raising of funds to defray hospital expenses and to aid needy patients. The decision that money should be contributed by the public for research was a radical idea in 1920. Money which our grandparents may have given to missionary societies and other special charities now has been channeled into the funds for research solicited annually by a great variety of foundations dedicated to poliomyelitis, cancer, arthritis, and tuberculosis. So it

may be difficult for us now, as we witness the large sums in dimes and dollars contributed to research programs for the investigation of this or that disease, to realize that this was a real innovation in the 1920's. However, another unique feature of this story is that the National Tuberculosis Association was the first organization to grasp the significance of a research program inspired and supported by competent investigators who were already interested in this field—a pattern which many philanthropic and diverse organizations and foundations have sometimes followed to an extensive degree.

From this volume one can trace the lines followed by research in tuberculosis: the early work on the tubercle bacilli, its growth, metabolism, biology, and chemistry; the extensive investigations on immunity and resistance, the nature of the tuberculin test, and considerations of the meaning of allergy in this disease. One important aspect was the story of the early developments of the concept of epidemiology in tuberculosis in which the work of Dr. Opie and his colleagues paved the way by a classic study on the spread of tuberculosis within families. One of the most noteworthy features of the Association's early program was the long-range character of many of the investigations which the Association supported, a feature which may not only reflect the fact that tuberculosis is a chronic disease but also the fact that the Association had confidence in the research people it chose.

Of the several fields developed over the years, those having to do with the tubercle bacillus and its specific effect were the ones followed most assiduously. Perhaps one of the most outstanding, which was of great theoretical and practical importance, was the work on tuberculin. As a result, purification of the active principle of tuberculin made a standard tuberculin possible for comparative testing on an international basis. Another field here might be called comparative immunology and the study of the native resistance of animals which varies characteristically among different species.

Not the least of the items in this interesting account is the mention of the names of those pioneers in the field of tuberculosis who worked together as a closely knit group even though their separate workshops might have been the laboratory, a clinic, a sanatorium, or an administrator's desk. Today in an age of greater specialization we are apt to have some nostalgia for that kind of cooperative endeavor. Included among names that we will do well to remember are: Dr. Gerald B. Webb of Denver, Colorado, Dr. Allen K. Krause first of the Johns Hopkins Medical School and later of Tucson, Arizona, Dr. William Snow Miller of the University of Wisconsin, Dr. William Charles White, director of the Tuberculosis League of Pittsburgh, and last but far from least, Dr. Esmond R. Long of Chicago and later Philadelphia, who is one of the authors of this volume.

MARY W. STANDLEE. *The Great Pulse—Japanese Midwifery and Obstetrics through the Ages.* Rutland, Vermont—Tokyo, Japan, Charles E. Tuttle Co., 1959. 192 pp. $4.50.

Reviewed by HERBERT THOMS, *Professor Emeritus of Obstetrics and Gynecology, Yale University School of Medicine.*

No aspect of man's cultural advances has carried forward so many persisting superstitions as that of obstetrics. Even today the superstitions surrounding pregnancy and childbirth are legion in all countries. Curiously, too, we find a universality of character which points rather clearly to common primitive ancestry. Examples of this fact are seen throughout this book by Mary W. Standlee who has made a searching study of customs and usages associated with childbirth in Japan dating from earliest times. Her effort was obviously one of persistence, sympathy, and understanding for she discloses data not ordinarily available to the alien investigator. While the major part of her book relates to practices and ideas extending into antiquity, her later chapters contain important information, statistical and otherwise, about present-day obstetrics in Japan. It is to be regretted that this aspect is not more developed, for obstetricians everywhere have a widening interest in maternity care programs throughout the world. This has come about through the worthy efforts of the World Health Organization and similar agencies.

It is to the historian that this book presents chief interest and to him it is an important contribution. Worthy of special comment are the excellent illustrations, the full annotations, the good writing, and the general appearance.

CHARLES LICHTENTHAELER. *La Médecine Hippocratique.* Editions de la Baconnière. [Neuchâtel, 1957.] 144 pp., illust.

Reviewed by F. GUERRA, *Research Associate, Yale University School of Medicine.*

IN the past decade, various medical circles, mainly in Europe and Spanish America, have claimed that modern medicine is in the throes of a crisis: the family physician is disappearing, the doctor is becoming nothing more than a technician, a materialist, and is, in consequence, losing the humane approach. Lichtenthaeler holds that this crisis can be averted by achieving the intellectual conscience in medicine, and that medicine alone—the history of medicine—might cure medicine. Slogans calling for integrated medicine, or personal medicine, are not deemed to be sufficient. The return to Hippocrates is something more, and the author believes that in order to overcome the present crisis in medicine, the physician must look back into the past of his subject. For this reason, in the four studies Lichtenthaeler offers on Hippocrates he re-opens the controversy between past and present medical authors.

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